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TEN CHEAP LESSONS

Easy, Engaging Ideas for Every Secondary
Classroom

by Tom DeRosa

For Feliz, whose love and patience made this possible

For Mom, Dad and Kristin for always believing in me

Ten Cheap Lessons: Easy, Engaging Ideas for Every Secondary Classroom by Tom DeRosa
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Introduction

Do you love math? If you're reading this, you're probably a math teacher, which means the answer is probably (but not definitely) yes. What would the likely answer be if you asked your family, friends or a random person on the street? After they stopped laughing, they would probably question your sanity for asking such a ridiculous question. "Nobody loves math," they'd say, "it's boring and hard." This is an attitude ingrained in people's minds by years of mind-numbing, drill-and-kill style instruction in school.

I remember one student telling me the same thing every time I tried to help her: "No matter how many times you try to teach me, Sir, I'm never gonna get it. **I'm just no good at math.**" This sort of attitude breaks my heart, and it is for students like her (who, incidentally, improved to the point she was arguably my best student by the end of the year) that I strive to break the mold of math instruction and help students really learn. This book is one small project to help other teachers do just that.

What will I find in this book?

- Exciting, engaging lesson ideas to help you break you out of the **lecture-take notes-do worksheet** cycle
- Projects that can be completed in a class period or a grading period and used as an alternative assessment or to supplement traditional practice
- Games to teach, reinforce or review
- Ongoing programs to build content area vocabulary, make interdisciplinary and real-world connections, and improve reading and writing skills
- Suggestions on how to adapt ideas to fit different subjects, classrooms and time frames, keeping things **cheap or free**, working around limited resources, and extending ideas into different directions

How is this book different than other teacher resources?

I own a lot of teacher resource books and have read countless more. I have researched more ideas and activities online than I will ever remember. When I set out to write this book, I wanted to create something I myself would want to buy: good ideas that could be applied to anything.

Instead of standalone activities, each idea is described within the context of an example lesson plan. Most teacher resource books and websites contain one seemingly wonderful activity after another, but don't tell you how to frame your lesson plans around it. Each idea presented here is accompanied by a mathematics lesson plan, suggestions on how to adapt ideas to fit different classrooms and time frames, and ideas for extending each lesson.

These ideas can be adapted for any subject. Most books and websites are designed for narrowly defined topics in specific content areas. Yet some of the most effective ideas I have found for my classroom came from completely unrelated content areas and topics. Each idea is presented with a specific example, but they are meant to be used for any topic and any state standard you find appropriate.

This is NOT a collection of worksheets. It seems that most resource book authors fail to consider that students like to do things OTHER than complete worksheets! Almost every resource book with "activities," "games," "hands-on," or any synonym for "engaging" in the

title is just another book full of drills, pointless games and other busy work that doesn't teach anything. Yes, there are worksheets included in this book that accompany specific ideas, but they require actual student engagement with the material.

Every idea was created with a real classroom in mind; where teachers have no time, no money and a lot of kids who need something different. Other books rarely take into account a lack of resources among both teachers and students, time constraints, or the incredible breadth and depth of material students must master in order to pass high-stakes standardized tests each year. This book is meant to be as easy as possible for any teacher to start using immediately.

Why should I listen to you, anyway?

I have been teaching for five years, two years of US History and three years of math. As a history teacher, I had a huge treasure trove of really exciting, easy-to-understand teaching materials at my disposal. When I switched to an alternative school, teaching 5th grade math through Pre-Calculus to kids who had been expelled from their school districts, I was shocked at how almost none of these tools had been adapted for math. Every book and website I found was another compilation of the most boring drills imaginable.

It seemed common sense to instead teach math like we teach social studies or English, and so as I moved on to a public high school, I began incorporating the kind of ideas that were successful in my former classroom into my mathematics curriculum. I knew I would have to shake things up to bring improvement and success to a group of kids whose spirit had been pummeled by a focus on "teaching to the test".

In these pages, compiled from my varied classroom experiences, what I learned as a Teach for America corps member, and constant research and reflection, you'll find ten ideas to make your classroom better. I believe I have built something unique, effective and easy to implement for teachers that want something more for their students.

On the first day of school this year, I told my Algebra students flat out: **"This is not going to be like any math class you've ever had."** I hope this resource is like no other resource you've ever used.

How Do I Use This Book?

This book is divided into ten ideas, each of which is organized as follows:

- **Background** – A short description of what the idea is and where it comes from.
- **How to Use It** – How this idea can fit into your lessons, curriculum and calendar.
- **Needed Materials/Optional Materials** – Short lists of cheap (or free) materials to facilitate each sample lesson.
- **Sample Lesson** – A sample lesson plan to compliment the idea.
- **Best Practices** – Tips on how to use the idea most effectively and avoid common pitfalls.
- **Adapting and Extending This Idea** – How to adapt this idea for different topics and content areas and extend it into other aspects of your curriculum.
- **Supplemental Materials** – Examples, project directions, and graphic organizers that are part of each sample lesson.

For **downloads** of examples in this book (so you can edit them for your classroom) visit my website:

<http://www.teachforever.com>

Idea #1

The Mini-Poster

Background

One of the easiest and most powerful ideas you can use to teach anything is a mini-poster project. When I hear "project" in most classes I think of giant poster paper or tri-fold science fair project boards which require weeks of work (or, like I did when I was in school, a lot of focused work the day before it was due).

The difference here is merely scale: students illustrate a "poster" no bigger than a **standard 8.5" by 11" piece of paper**. Thus the focus is off the process and back on whatever it is you want them to know and understand.

How to Use It

This is most suitable as a short-term project to be done mostly outside of class, but it can also be used as part of independent practice or an alternative assessment to shake up your normal routine.

Needed Materials

- Copies of project directions and examples for each student
- One 8.5" by 11" paper per student (preferably unlined white paper)
- Pens
- Pencils
- Markers, Colored Pencils or Crayons

Optional Materials

- Scissors
- Glue or Tape
- Surplus newspapers or magazines (for cutting out pictures)
- Internet access (for finding and printing pictures)

Sample Lesson

Time Needed: One 45-55 minute class period

Objective: This example project is designed to help students understand the concept of independent and dependent variables. Understanding the difference is something 9th graders are tested on in Texas, but more importantly it helps create a deeper understanding of linear relationships and more complicated functions.

Warm-Up/Do Now: Students label cause and effect in the following situations:

1. It gets colder outside, electricity bill goes up
2. You gain weight, you eat fast food every day
3. Your grade in this class drops, you forgot to turn in some assignments
4. Ice cream sales increase, the temperature is rising quickly

Introduction: An easy way to introduce this idea is to talk about cause and effect relationships, which students discuss in English and almost every other class. At their most basic level, independent variables are the cause and dependent variables are the effect. You

could make a lot of comparisons students might find easier. This simple table can be discussed or be part of their notes:

INDEPENDENT	DEPENDENT
Cause	Effect
Before	After
Input	Output
What you do	What happens

Return to the Do Now problems, and ask students to identify the independent and dependent variables in each pair.

Guided Practice: Work through practice problems from your textbook or quality supplemental resources. Review the answers together and address any problems that arise.

Independent Practice/Assessment: Pass out and then read through the project directions and examples.

The idea of this particular project is that students will use two pictures (drawn or borrowed) to illustrate the relationship between independent and dependent variables. The project instructions contain numerous examples, but the premise is to have a picture of one thing that directly affects another, label them appropriately, and write a simple statement to explain the relationship (see the example). I explain that the example poster took all of 5 minutes to create after deciding on a situation to use. Students are free to use any of the examples included (except the completed example) or to create their own.

Closing: Give students a multiple choice question from a standardized test on this objective as a quick informal assessment. Remind students of due dates if you assign the poster as a short-term assignment.

Best Practices

This project, as with all of the ideas in this book, are designed to be used with students of all abilities, especially those that find your material especially challenging (LEP/ELL, struggling readers, and students with modifications). Illustrating vocabulary is a common strategy that will work wonders.

Grading is fairly easy; for those of you who like to create rubrics to keep things objective, these are the standard criteria:

1. **Following directions:** Did they include all of the elements required (pictures/drawings, explanation, labels)?
2. **Clarity:** Does their example make sense and is easy for others students to understand?
3. **Effort:** Did the student put in time and effort into making the poster colorful, attention grabbing, and easy to read and see from afar?

Visit Rubistar (rubistar.4teachers.org) for the best free tool available for creating great rubrics.

I always stress to my students that on mini-poster projects, they need to keep in mind the other students who will look at their posters on the wall to try to understand the concepts, so they need to make it easy for anybody to understand. This forces them to reach the highest level of Bloom's Taxonomy (evaluation). Thus a "simple" project becomes something much more meaningful.

Remember to point out that illustrations for this type of poster can be drawn, printed out from the Internet, or cut out of scrap newspapers or magazines. This helps students get started (and finished) quicker, especially those who think they can't or don't know how to draw what they're thinking.

This is also a quick and easy way to get some meaningful student work to display on the wall. This will both improve your classroom culture (by making your room more inviting and giving students a sense of pride in their work), impress your administrators, and give you a resource for reteaching. These posters become something you can constantly refer to and that students can use to help them with future work.

Adapting and Extending This Idea

The adaptable core of this project is that students are forced to illustrate and explain a particular concept. Use it to help students remember simple concepts and vocabulary by illustrating them and providing examples or explanations. By touching on multiple intelligences--linguistic (words), spatial (visual), kinesthetic (artistic, creative), logical-mathematical (in math at least)--you'll reach more students. As I tell my students, "these are easy ideas, but also easy to forget, so we do things like this to make sure we know what we need to know."

Remember that this project could be done independently (no pun intended) of any lessons on most any topic and completely outside of class. It could be a standalone minor project grade, or included as part of a work portfolio.

The mini-poster has many simple applications for high school mathematics. In these classroom-tested posters, students had to include an example, a correct answer, and a written explanation of how to do it:

- Rules and examples for adding, subtracting, multiplying and dividing integers
- Solving one and two-step equations.
- Illustrate parent functions.
- Demonstrate the effects of changing parameters on the graphs of quadratic equations
- Illustrate content-area vocabulary from the Word Wall (see **Idea #2**) for extra credit.

In other high school courses, this can be used for any easy (but easy to forget) concept. In U.S. History, I used almost the same project to illustrate that the states had more power than the federal government under the Articles of Confederation; students showed examples of one thing having power over another (cat vs. mouse, etc) and labeled them accordingly. They never forgot the significance.

Supplemental Materials

- Project directions
- Sample mini-poster

Poster Project: Independent vs. Dependent Variables

WHO: You (and everybody else).

WHAT: Make a poster (on regular 8.5" by 11" paper) that uses pictures to show the difference between a dependent and independent variable.

HOW: Find or think up an example of a dependent and independent variable (use the list below to start). Your posters must have: 2 pictures, one to illustrate each variable (drawn, cut out from newspaper or magazines, or printed out from the Internet), a title, labels for "dependent variable" and "independent variable", and a caption that says:

_____ depends on _____.
your dependent variable *your independent variable*

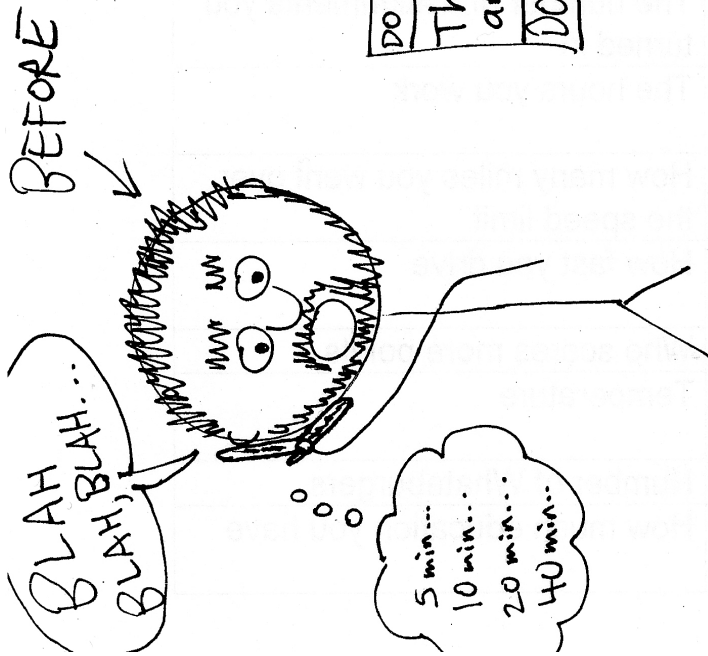
WHERE: Start it in class, but complete it at home, during tutoring, or when you have completed your daily work

WHY: To show mastery of this important objective and prepare for state testing

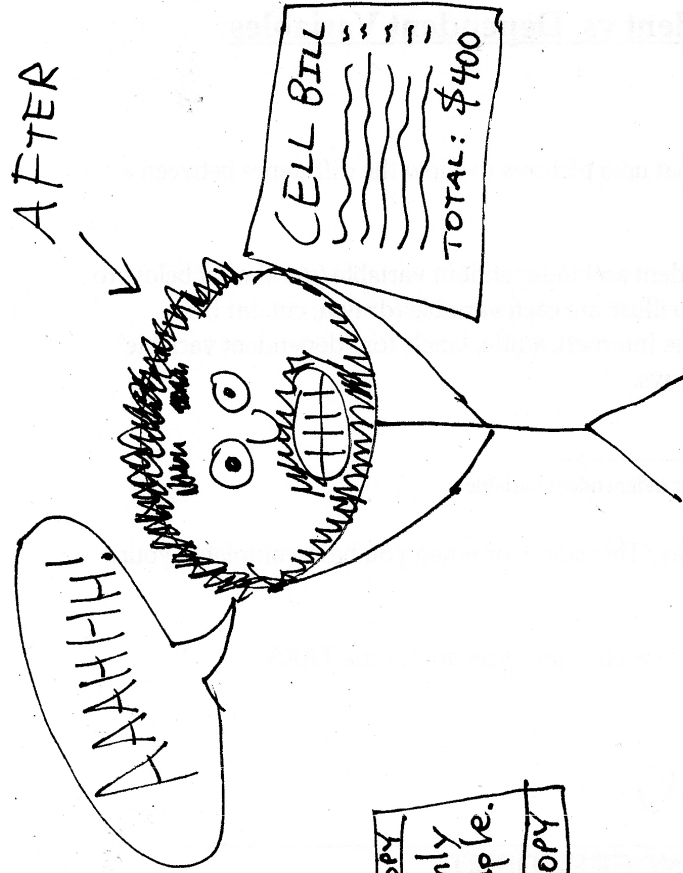
WHEN: Due _____

EXAMPLES: (example poster on back)

DEPENDENT	INDEPENDENT
Cell phone bill	Minutes used
How far you can drive	The amount of gas you have
Your Six Weeks grade	The number of assignments you turned in
How much money you earn	The hours you work
Cost of a speeding ticket	How many miles you went over the speed limit
Time it takes to drive somewhere	How fast you drive
Result of a football game	Who scores more points
How much air conditioning you use	Temperature
Total calories and fat	Number of fast food burgers
Opportunities for high-paying jobs	How much education you have



INDEPENDENT VARIABLE



DEPENDENT VARIABLE

★ Your cell phone bill depends on how many minutes you use!!! ★

YOUR CELL PHONE BILL!

Idea #2

Using a Word Wall in the Secondary Classroom

Background

A word wall, for the uninitiated, is basically a vocabulary bulletin board. This is widely used in elementary classrooms (especially early elementary) for **sight words**, words that a reader should know on sight without having to look it up or think about it. Using word walls in high school classrooms is uncharted territory, however. Most books and websites about word walls are designed solely for elementary students. By adapting these ideas, high school vocabulary-building ideas and successful ideas from my experience teaching social studies, I built this project.

The project requires students to recall or look up the definitions of about 20 words from the word wall, write clues (definitions, examples, pictures, or graphs) in their own words, and arrange them into a crossword puzzle.

How to Use It

The lesson plan details the crossword puzzle project. It would fit best at the end of a unit, grading period, or semester. Alternately, it could be used before a state standardized test. It is divided into two days, the first focused on creating the clues and the second on the creation of the puzzle.

The word wall itself can (and should) be used on a daily basis (see *Adapting and Extending This Idea* below).

Needed Materials

- Word Wall – Pick 15-25 of the most relevant, frequently used content-area vocabulary you are currently covering. Sentence strips (or any tagboard) are easy to acquire, and when you write your vocabulary in large block letters visible from anywhere in the room, they're the perfect way to display your words.
- Copies of project directions, reflection questions, and grid paper (The directions and reflection questions could be squeezed onto one side of a page and the grid could be printed on the other, saving paper and copies) for each student
- Resources to find formal definitions (student notebooks, textbook glossary, etc)
- Pencils

Lesson Plan

Time Needed: Two 45-55 minute class periods

Objective: Students will demonstrate knowledge and comprehension of content-area vocabulary by writing definitions or examples in their own words, or creating relevant pictures or graphs. This vocabulary has already been covered at least once and is required for state standards and tests.

Warm Up/Do Now: Have students define or give an example of any one word from the Word Wall.

Introduction: Ask for students to share their answers for the Do Now assignment. Clarify and correct any problems that are immediately apparent. Tell your students that what they just did together is what you are going to ask them to do with other words from the Word Wall. Explain the importance of the vocabulary to what you have done so far, and towards your goals for the school year. Their mastery of content-area vocabulary is one of the hardest parts of any subject, and makes meeting state standards infinitely easier.

Pass out the project directions and read through what they are expected to do together. Point out all of the reference materials available for finding examples and definitions they can use to derive their own.

Guided Practice: Give your students the option of completing the same first word for their crossword puzzle as a whole group. Using grid paper, write a word vertically somewhere in the middle of the grid (start with something you did already in the Do Now/Introduction). Number the first letter "1". In the space below the grid, write "Down" and underline it. Write "1" below and the clue you created earlier.

Independent Practice: Students complete Day One of the project, where they create the clues (*see Supplemental Materials*).

Closing: If you are concerned about your students going off task, you might require them to turn in the clues they have finished at the end of Day One (you can return them at the beginning of the next class). After students have turned in their completed projects on Day Two, discuss the Reflection Questions as a whole group.

Best Practices

If you're unsure about using the crossword puzzle, that part could be replaced with a word search or anything that would require giving the clues a second and third look. The important part of the project is that students create the clues in their own words, ensuring some level of understanding.

Make sure your students complete the **Reflection Questions** for part of their grade. Besides insuring they are doing some content-area writing, it reminds them of the importance of such work. These also benefit you by helping you learn which concepts need reteaching.

As you can see in the project directions, each day has a specific task with concise steps to keep students focused and on track to finish. The first day is devoted to creating the clues, and the second day is set aside for creating the puzzle and answering the reflection questions. I also included a checklist to make sure they complete everything before turning it in.

I created a 20 column, 20 row table of .25" by .25" squares to give to students on Day Two, to avoid time wasted drawing boxes and fiddling with rulers. Any grid paper would suffice, or something similar can be created in a word processor in a matter of minutes.

20 words may be too much for students to complete in the allotted time—reducing the number to 15 should give classes that are working diligently enough time to finish it in class. You may also keep the 20 words but allow students to work in pairs so they can split the work, although this should be a last resort.

If the students have textbooks at home (which this project assumes they do not, since it was designed in the context of a school with limited resources), you can allow extra time to complete it there when appropriate.

Adapting and Extending This Idea

The beauty of this project is that it is appropriate for any subject and most grade levels. Each classroom can prepare the most appropriate vocabulary list for their Word Wall. Additionally, this project can be repeated in the same classroom with a completely different list of words later in the school year. If your students would groan at the prospect of creating another crossword puzzle, change the product into a word search, jumble, matching list or anything that still requires them to create their own clues (as discussed above).

Most importantly, you should make the Word Wall a regular fixture in your classroom. Here are ten relatively simple ideas that you could easily use in your next class (assuming you already have a Word Wall):

1. **As a weekly "Do Now"/"bell ringer"/start-up activity.** Ask your students, "Pick two words from the word wall that you know and write a definition or example for each one." This can be done weekly (at least), and make sure to have them do a different word each time! This is a quick and painless review that reinforces the importance of the vocab.
2. **Create an children's alphabet book.** Students create a page for a vocabulary word from each letter of the alphabet, with a picture or drawing and simple explanation for each term. This is better to use at the end of the year, when you'll probably have vocabulary from A-Z already on the word wall. Don't turn this into a scavenger hunt where the students find random words from the textbook—that's just wasted time. You can replace this activity with any differentiated product—a story, song, poem, etc—that requires the students to understand and use vocabulary correctly.
3. **Mini-posters.** Drawing on **Idea #1**, the mini-poster is one of the most effective and easiest to implement. Students create a mini-poster on blank unlined paper that shows one word, a simple definition, and an example problem. The problem must be solved and explained. Afterwards, the work is posted in the classroom as a reference for students and referred to by the teacher consistently.
4. **Bilingual Glossary.** If you have a large number of ELL/LEP students in your classes like I do, these types of projects are important for them to build not only their content-area knowledge but their overall English reading skills. Students create a glossary of a set number of word wall terms that includes the word, a definition, and an example. The word and definition should be in English and their first language. Internet access might be needed in classrooms where you have many different primary languages spoken so that students can translate words. You can also make most of the other ideas here into a bilingual assignment.
5. **Include "test question" words on the Word Wall.** For example, besides content-area vocabulary like slope, y-intercept and linear function, my students need to know what to do when they are asked to *simplify* or *evaluate* something. In addition, there are terms for processes or methods, like using the *vertical line test* to determine if a graph is a function, that are often overlooked. Include all of the most frequently used ones in your list.
6. **Give your Word Wall list to other teachers.** Keyboarding, business and computer teachers are often happy to incorporate core area vocabulary into their curriculum. If they're not open to it, ask them to offer it as an extra credit assignment. Ask English teachers (especially if you are teamed) if they could incorporate it as well. Make sure you give them something ready-made and ready to use: they don't want extra work any more than you do.

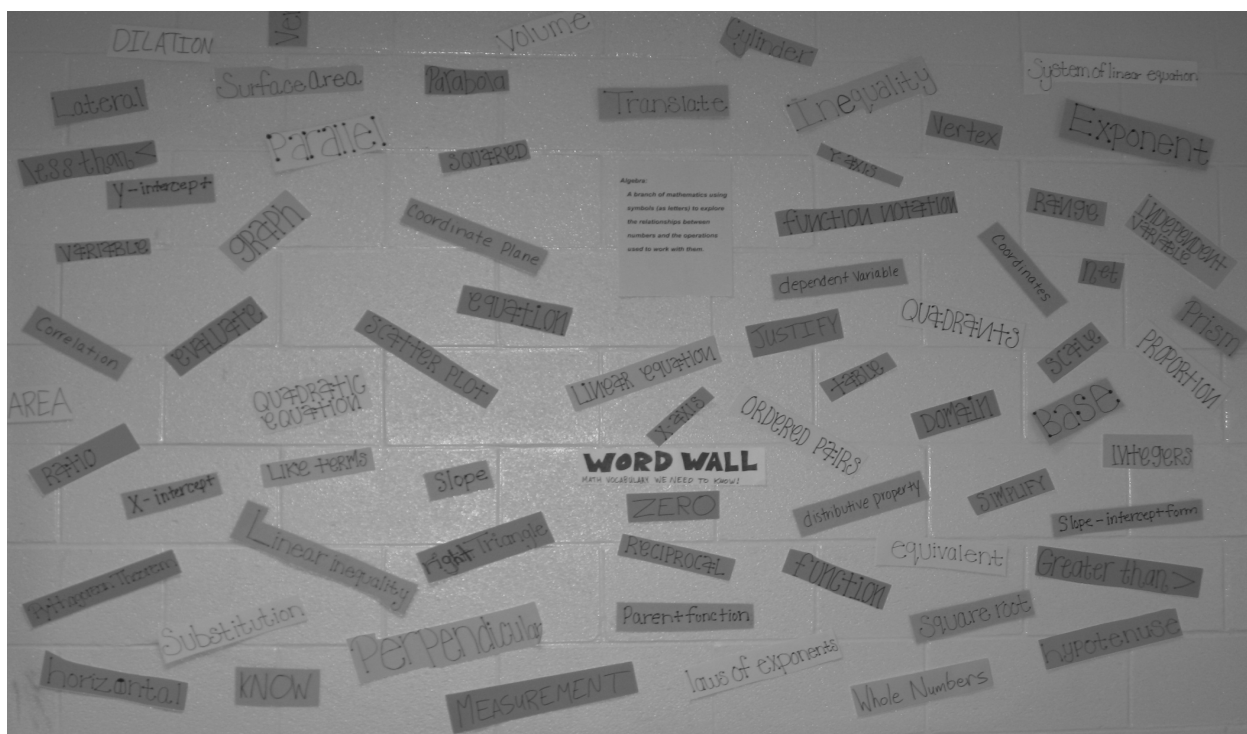
7. **Incorporate Word Wall terms into daily assignments, tests and quizzes.** This is easy if you use some kind of Interactive Student Notebook, but make sure to put some typical vocabulary exercises into your other assignments and quizzes. The easiest way is to do some fill in the blank, short answer, or matching. I use fill in the blank about the previous day's work as a "Do Now" often.
8. **Create a team or grade level Word Wall.** Work with your team or across the disciplines of your grade level to have common terms on every word wall. This way students will see (and hopefully use) the words repeatedly. This requires a bit of coordination and cooperation—like #6 above, you'll have to have some ideas that everyone can use quickly and easily ready to give to reluctant participants.
9. **Have your students actually solve the crossword puzzles.** As a way to build a positive classroom culture and recognize quality work, pick out the best puzzles from each class and give them back to the students in that class as an extra credit assignment.
10. **Use it and refer to it constantly.** This means that you should refer to it during your lesson ("What's that word for a graph that's a straight line? It's on the Word Wall."), update it frequently, and incorporate it one of the ways described above (or come up with your own). It also means that words need to come off the wall periodically—they might be important for one chapter or unit, but not for the big picture. The other side of this is to be judicious in which words you put up there in the first place—you don't want a huge turnover every grading period either.

Supplemental Materials

- Word Wall sample pictures
- Project directions and checklist
- Reflection Questions
- Grid paper



The word wall used for this example, from the 2007 fall semester.



A whole year's worth of words, used for an end-of-year review in May 2007.

WORD WALL PROJECT

Directions:

Create a crossword puzzle using the vocabulary on the **Word Wall**. The clues will be definitions in your own words **or** an original example, graph, or picture to illustrate the definition.

Day 1: CREATE THE CLUES:

1. Copy down the list of words you will use.
2. Look up definitions in the resources I have given you.
3. Write definitions or examples **IN YOUR OWN WORDS** for each vocabulary word. These will be the clues in your crossword puzzle.

Day 2: CREATE THE PUZZLE:

3. Create the actual puzzle using grid paper. Write your clues underneath.
4. Write the answer key on a separate paper.
5. Answer the **Reflection Questions** on the back of this paper.

These 2 days are the only days we will work on the project in class. If you are not finished you have to do the rest on your own time.

Project Checklist:

Make sure you have done all of these before you turn in your project.

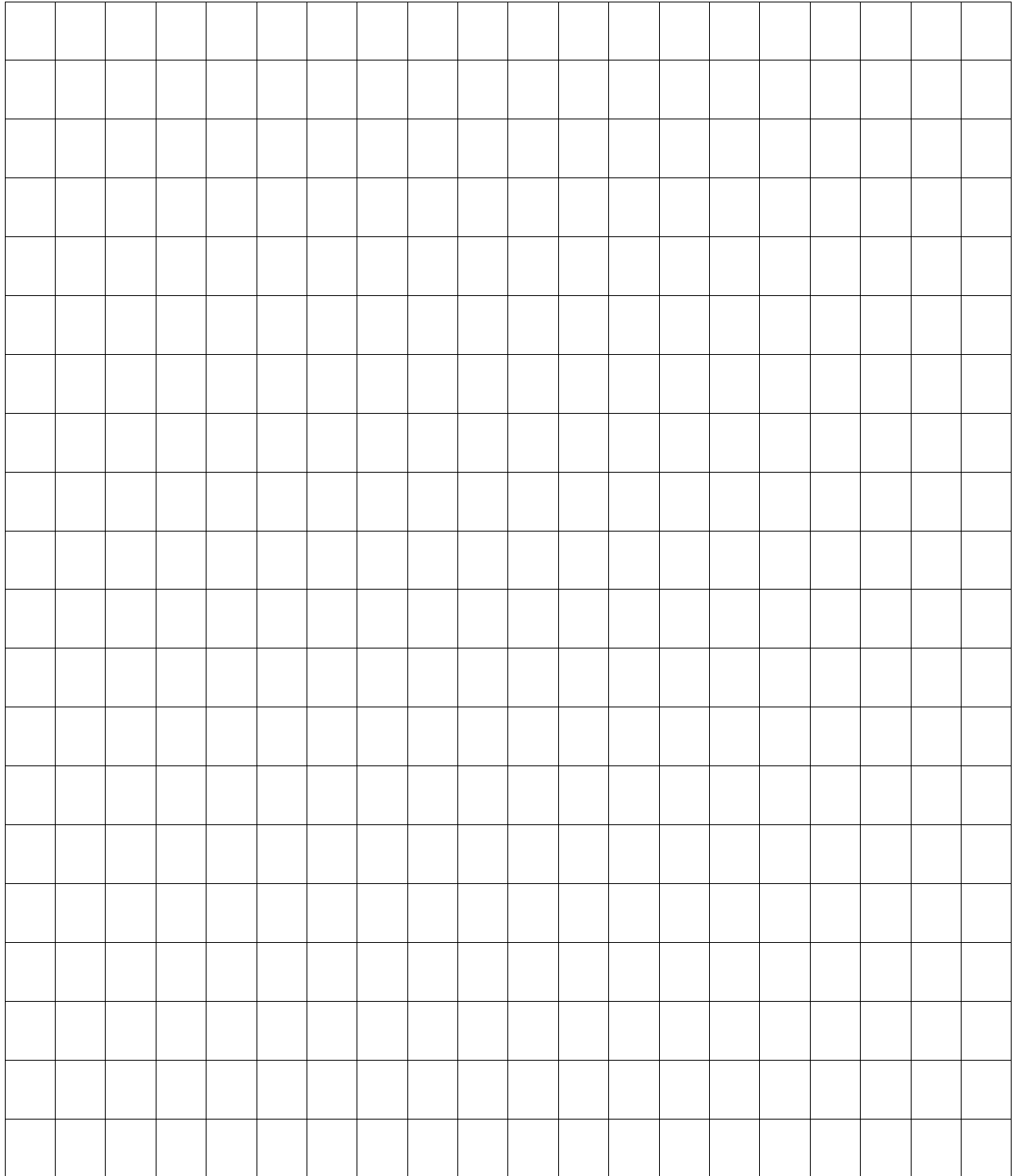
- **At least** 20 words from the Word Wall
- Clues (definitions/examples) are in **my own words**
- All words have clues
- Answer key done
- Complete puzzle
- Reflection Questions answered

REFLECTION QUESTIONS

This is part of your grade on this project! Answer these questions and turn this in with your puzzle.

1. List the words that you already knew the definition for in your head.
2. Why is it important to write definitions in your own words?
3. Why do we need to know these vocabulary words?
4. Which words do you understand better after doing this project?
5. Which words are you still confused about?

Word Wall Project Grid Paper – Use the grid below to help you create your crossword puzzle.



Idea #3

Card Games

Background

When I was much younger, my sister and I used to play rummy, spit and every other card game during lazy summer days at home. Reflecting on these memories, I had an idea for teaching simplifying equations using a card game where the deck would consist of algebraic terms. Like rummy and many other traditional card games, the object is to make groups of matching cards. Then, students combine their groups of like terms, resulting in simplified expressions.

I designed this with my 9th grade Algebra I students in mind, because they usually come to me unable to simplify expressions or equations. This little problem, like so many little problems, gets compounded as we move onto more complicated topics and makes things infinitely more difficult than they need to be.

How to Use It

In the Algebra classroom, this game is appropriate for the first few weeks of school when you're reviewing Pre-Algebra material.

When adapted to your specific content, depending on the topic, this could be used to introduce new material or just as easily for reteaching or review before an assessment.

Needed Materials

- Decks of cards (enough to supply groups of 4-6 players) – To make the decks easily and on the cheap, use white 3"x5" index cards and at least 4 different colors of highlighters or flip chart markers (so the terms won't bleed through). Each term gets a different color (a and a^2 are blue, b and b^2 are red, etc). Alternately, use colored index cards for the sets and one marker that won't bleed through, cut up scratch paper and use trusty blue, black and red pens, or get card stock and print out cards on the computer. Making 6-8 decks will take about 2 hours.
- Copies of *Like Terms* Rules and Scoring Sheet handouts (see *Supplemental Materials*)

Sample Lesson

Time Needed: One 45-55 minute class period

Objective: Students will be able to simplify algebraic expressions by combining like terms.

Warm Up/Do Now: Start off with a simple word problem that will lead into the lesson:

Mr. D stops at a fruit stand and buys 2 apples, 3 bananas, and a grapefruit. If he stops at another stand and buys an apple, 2 bananas, and 3 grapefruits, how many of each fruit would he have?

Introduction: Review the answer. Tell your students that the main difference between this elementary problem and algebra is that apples, bananas and grapefruits are represented with symbols (variables). So in algebra, we might have written our answer as $3a + 5b + 4g$, and those variables could stand for the prices, so we could find out how much money we

would need or spent. What we just did is called combining like terms, which is what we're going to learn and practice today.

Distribute the *Like Terms* Rules and Scoring Sheets to each student. Read through, clarify and show examples using the decks before arranging students into groups or dealing the cards. Afterwards, arrange students into groups of 4-6 students and hand out the decks.

Guided Practice: Have students deal out 7 cards to each member of their group. Then have the first person in each group complete a turn with the teacher walking the whole group through it, so each group sees a clear example and knows how to proceed. Hold off on explaining scoring until most groups have played one full game independently. Understand that it may take time for students to grasp the rules of the game itself (but probably not the concept).

Independent Practice: Constantly monitor and be prepared to walk groups through the game procedures to get them to the point where they can play on their own. I recommend having groups play through no more than 2 full games. To review, I went over an already filled out score sheet with 2 sample scores, one from a winning hand and one from a losing one.

Closing: Challenge students with 1-5 sample questions to end the lesson. Follow up the next day with a filled out sample score sheet for them to total (you can borrow ones from students that are correct and cover the totals OR take one that is incorrect and have the students identify the mistakes) and related simplification activities.

Best Practices

Don't assume your students have played rummy or similar card games before—my students hadn't, so the rules in the *Supplemental Materials* are simpler than traditional rummy.

As far as knowing which cards go together (and thus which terms can be combined), I think there was no problem—that part of the objective was clear even in classes where the rules of the game were confusing. What was lacking in the classes earlier in the day was a better explanation on scoring—taking the tally of each group of cards and turning it into a longer expression.

Stress to your students that as long as they understand and remember the main idea of the game—which terms are like terms and how to simplify expressions containing them—it doesn't matter if the rules of the game itself were confusing. As with all the ideas in this book, we never want students to get lost in the process of doing an activity and miss the objective.

If the game seems a little too vanilla, you could add a few new cards to the deck to create some twists:

1. **"Killer" cards** - Add cards that don't have any like terms in the rest of the deck, essentially ending a player's chances of winning since you can't complete a set. Maybe there's two like terms, but a third or fourth matching card doesn't exist (i.e. z^2 , x^2y^2 , a^4 , etc)
2. **Skip, reverse and wild cards** - My students may not know rummy, but they do know *Uno*, so you could add these to the deck as well.
3. **"Steal" cards** - Action cards that allow players to steal one card from any other player that they need to complete a group, making the game a bit more competitive.

Adapting and Extending This Idea

As an extension, students could develop their own game to help other students practice and remember how to simplify expressions (or do anything, really). It doesn't have to be a card game like *Like Terms*; it can be any type of game as long as it teaches a rule clearly, is easy to understand and play, and is fun. Students can use the questions they answered and rules they observed along the way to help create their game.

The heart of this game is making **groups of matching cards**, which can easily be adapted to any content area. Here are ideas for alternate decks of cards addressing national standards in each content area:

- **Language Arts** – The deck could be made of parts of speech, groups of synonyms and antonyms, or works to be classified by genre, time period or as fiction and non-fiction. Using some of these suggestions could help make English more accessible to your English Language Learners, students with special needs, and other reluctant readers. [*NCTE standards for English K-12*]
- **History** – National standards for US History cover a lot of ground, and certainly many state standards are even more encompassing. An adapted version of this game could serve as a way to review a wide range of material all at once. For example, students could group events, key terms or important people by era or relative to given events. Similarly, World History students could group influential civilizations by year, eras or locations. In both classes, this is an ideal tool for studying for semester, end-of-year or AP exams. [*NCHS standards for US 5-12 and World 5-12*]
- **Science** – Like history, the breadth and depth of content in high school science classes lends itself naturally to grouping games. For example, students could arrange elements by their periodic table groups, or could put steps of various cycles from Earth Science in their proper order. [*NRC standards 9-12*]
- **Fine Arts** – This game would be especially useful for art and music history. For example, students could identify works by artist, genre, style, historical context or similar characteristics. [*NA-VA.9-12.4, Understanding the Visual Arts in Relation to History and Cultures and NA-M.9-12.9, Understanding Music in Relation to History and Culture*]
- **Mathematics** – An alternate deck could consist of linear equation graphs, for example, and the object would be to make groups of graphs with the same slope. Other decks could be made of quadratic equations and their factors, three-dimensional shapes and their nets (or multiple views of these figures), systems of equations (or inequalities) and their solutions, or families of functions. [*NCTM standards for Algebra 9-12 and Geometry 9-12*]

Here are **traditional rummy rules** if you think your students are familiar with the draw-play-discard style of play. This game is a bit more competitive than the streamlined version that's part of the sample lesson:

- Each player is dealt 7 cards.
- The remaining cards are placed face down—this is the draw pile.
- The top card is flipped over to a new pile—this is the discard pile. Players can also draw the top card from the discard pile during their turn.
- Each player draws a card, looks for a 3 or 4 card set of matching cards, and places them face up on the table in front of them if they have any.
- Whether they have something to play or not, they must then discard one card to end their turn.
- Play continues until someone discards their last card and has no cards left.

- The winner adds everything they placed on the table together. Everyone else subtracts what's in their hand from what they had placed on the table.

At this point in the real game of rummy, players would tally their score based on points for certain types of cards. Assign points, then review each winner's cards as a whole group to check for accuracy, or have students record the cards in their groups so that you can check if they are grouped correctly.

Finally, you could take only the idea of a custom deck of cards covering your content and use them to play Go Fish, for example, or any game of your choosing (or design).

Supplemental Materials

- *Like Terms* rules and instructions
- *Like Terms* Scoring Sheet

Like Terms (a math card game)

Like Terms is a game where the objective is to collect as many groups of 3 or 4 “like terms” as possible and then being the first person with no cards left in their hand. The deck contains 7 groups of cards: 1-10, a to 10a, b to 10b, and so on for c, a^2 , b^2 , and c^2 .

How to Play

- Each player gets 7 cards.
- Players lay out their hand face up in front of them for all to see and arrange them into groups of 3-4 **like terms** (for example, $8a^2$, a^2 and $3a^2$ would go together).
- Each player draws one card from the **draw pile** and tries to make sets of 3-4 like terms.
- Repeat until one player has **completed all of their sets** and **no cards left** in their hand.

What is a group of Like Terms?

- Cards with “a” only go with other “a” cards, but not with a² cards. “B” cards only go with other “b” cards, and b² only with other b² cards. The same goes for “c” cards. The integers 1-10 only match up with other integers with no letters.
- Like terms (you **CAN** play): 10b, b, 6b
- Unlike terms (**CAN'T** play): 3c², 4c, 5c², 7c

How do you figure out your score?

The **winner** gets to **add** every group they put down on the table. For example, if you had:

$7a^2$	$6a^2$	$2a^2$	$8a^2$	$5a^2$	$3a^2$	b	$2b$	$6b$
1			2			4		
c			$2c$			$3c$		

Add up each group for your score: $15a^2 + 16b^2 + 9b + 6c + 7$.

The rest of the players will **add** whatever they put on the table, but then **subtract** everything still left in their hand. For example, if you had:

On table:

In your hand:

6b	5b	10b	3b
----	----	-----	----

a

$2b^2$	$3b^2$
--------	--------

3	8
---	---

5c	7c
----	----

Your score would be $24b - 5b^2 - a - 12c - 11$.

What do these scores mean?

We can use the rules and scores of *Like Terms* to simplify algebraic expressions in Algebra class. We will also plug in numbers for a, b and c to come up with an official score.

[illegible]

Like Terms Score Sheet

Use this sheet to keep track of your scores.

GAME 1

ADD (each group you put on the table):

--	--	--	--

--	--	--	--

--	--	--	--

--	--	--	--

--	--	--	--

GAME 2

ADD:

--	--	--	--

--	--	--	--

--	--	--	--

--	--	--	--

--	--	--	--

SUBTRACT (what's left in your hand):

--	--

--	--

--	--

--	--

SUBTRACT:

--	--

--	--

--	--

--	--

SCORE 1:

SCORE 2:

Idea #4

Finding Jobs in the Real World

Background

I realized very quickly into my first year of teaching Algebra that my students didn't see the value of what I was teaching them. The familiar mindset of "When I am ever going to use this in the real world?" permeated my classroom. Thus I set out to prove to them just how valuable and necessary the skills we were learning would be in the real world.

I took my students to the computer lab, gave them a list of job search engines, and asked them to search only for "algebra" or "math". They discovered that becoming a math teacher (despite what they may have thought) was far from the only thing someone could do with excellent math skills.

How to Use It

I used this project to break up the long stretch between the beginning of the school year and Thanksgiving, but it should be used when you believe your students don't see the inherent value in your subject matter. Alternately, this could be a meaningful, engaging end-of-year project.

Needed Materials

- Computers with Internet access
- Copies of the *Using Math in the Real World* packet for each student

Optional Materials

- LCD projector connected to a computer with Internet access

Sample Lesson

Time Needed: One or two 45-55 minute class periods (depending on how quickly your students work)

Objective: Students will connect the study of mathematics to its uses in the real world. [NM-PROB.CONN.PK-12.3: *Recognize and apply mathematics in contexts outside of mathematics*]

Warm Up/Do Now: Students complete this journal topic: "List all the ways you use math while you're NOT in school."

Introduction/Guided Practice: Upon arrival to the computer lab, students pick up the *Using Math in the Real World* project worksheet and sit at assigned computers. The teacher will explain the directions for the Internet research project as students read along on their project worksheet. Either on the projector or by having students complete the steps individually, the teacher will demonstrate how to find and fill in one complete job profile.

Independent Practice: Students will follow the example and instructions on their project worksheet to profile 10 jobs that require math skills (see *Supplemental Materials*). The teacher will monitor, help students summarize job descriptions and decipher confusing job listings.

Closing: As a whole group, the class will discuss the Reflection Questions listed at the end of the project worksheet and share initial impressions of how they might answer them. Students will be reminded of due dates and when and how they will be able to do research independently (if necessary) to complete the project.

Best Practices

I designed this project so students could complete it in the computer lab in two 45-55 minute class periods. Obviously this is not always possible due to the availability of labs, lack of flexibility in your curriculum calendar, or whether you can keep your students focused in such an environment. Depending on the readiness of Internet access in school or at students' homes, you can reduce your lab days to one or none. You can also reduce the number of profiles they have to complete if necessary (from 10 to 5 perhaps), but remember that part of the value of this project is to show your student the wide range of jobs available. If you cut the number of profiles, they may end up seeing only 5 identical listings.

Obviously, any project where students are accessing the Internet requires careful monitoring. Be aware of your district and campus policies before you start. It helps to be computer savvy, of course, but you don't have to be Bill Gates to identify inappropriate usage. If you're concerned about being able to keep up with your students online, try to ensure a computer proctor, fellow teacher, tutor or aide will be there with you.

Finally, make sure you have something for students who complete the project quickly to do as long as you're still in the lab. There's no shortage of good math websites that will educate and entertain (try **coolmath.com**).

Adapting and Extending This Idea

It takes only the right keywords to adapt this project for any high school classroom. Visit the sites listed in the project worksheet (or other search engines of your choosing), and conduct your own searches using the most common sense terms for your subject. Find 2-3 simple terms that will provide your students the largest and most comprehensive list of jobs to profile.

You can extend this project by sending home a parent survey that asks about their jobs and then inviting them to visit your classroom. Reach out to your community as well.

If you have a large number of students interested in a particular job aligned to your content area, arrange a field trip to see that career in action.

Most importantly, if your school has a career day, make sure numerous jobs in your field of study are invited. If it doesn't, start one!

Supplemental Materials

- *Using Math in the Real World* project worksheet

Name: _____

Algebra I

Six Weeks Project: Using Math in the Real World

Directions:

1. Use the Internet to find 10 jobs that require math skills.
2. Fill in a Job Profile for each job.
3. At the end, answer the Reflection Questions.

Rules:

1. Search for the words “**algebra**” or “**math**”.
2. **NO TEACHING JOBS!** There are plenty of other jobs that require math skills!
3. Try to find jobs you are interested in pursuing in the future.

Job Search Websites to Use:

- Monster (www.monster.com)
- Yahoo! HotJobs (hotjobs.yahoo.com)
- CareerBuilder (www.careerbuilder.com)
- Dice (www.dice.com)
- Math-jobs.com (www.math-jobs.com/us/)

Due: _____

Sample Profile			
Job Title	Employer/Company	Search Word:	Which Website?
Senior Programmer - Tools	National Computer Entertainment Co.	algebra	Hotjobs.yahoo.com
Brief Description of the Job	What Type of Math Skills Do You Need?		Location
Program tools for games and for other programmers to use. Work with artists, designers, programmers and producers.	College degree in Computer Science, Math, Physics, Engineering or a related field		San Diego, CA
	3D graphics math, linear algebra		Salary/Pay (if given)
			Not given

Profile #1			
Job Title	Employer/Company	Search Word:	Which Website?
Brief Description of the Job	What Type of Math Skills Do You Need?		Location
			Salary/Pay (if given)

Profile #2			
Job Title	Employer/Company	Search Word:	Which Website?
Brief Description of the Job	What Type of Math Skills Do You Need?		Location
			Salary/Pay (if given)

Profile #3			
Job Title	Employer/Company	Search Word:	Which Website?
Brief Description of the Job	What Type of Math Skills Do You Need?		Location
			Salary/Pay (if given)

Profile #4			
Job Title	Employer/Company	Search Word:	Which Website?
Brief Description of the Job	What Type of Math Skills Do You Need?		Location
			Salary/Pay (if given)

Profile #5			
Job Title	Employer/Company	Search Word:	Which Website?
Brief Description of the Job	What Type of Math Skills Do You Need?		Location
			Salary/Pay (if given)

Profile #6			
Job Title	Employer/Company	Search Word:	Which Website?
Brief Description of the Job	What Type of Math Skills Do You Need?		Location
			Salary/Pay (if given)

Profile #7			
Job Title	Employer/Company	Search Word:	Which Website?
Brief Description of the Job	What Type of Math Skills Do You Need?		Location
			Salary/Pay (if given)

Profile #8			
Job Title	Employer/Company	Search Word:	Which Website?
Brief Description of the Job	What Type of Math Skills Do You Need?		Location
			Salary/Pay (if given)

Profile #9			
Job Title	Employer/Company	Search Word:	Which Website?
Brief Description of the Job	What Type of Math Skills Do You Need?		Location
			Salary/Pay (if given)

Profile #10			
Job Title	Employer/Company	Search Word:	Which Website?
Brief Description of the Job	What Type of Math Skills Do You Need?		Location
			Salary/Pay (if given)

Reflection Questions:

1. List some ways you could find out more information about jobs you were interested in.
2. Which job did you find the most interesting? Explain why.
3. What do you think is the most important thing you learned through this project?
4. Is there anything you think you now want to know more about based on this project?

Idea #5

Use Labs Outside of Science Class

Background

After hearing the same concerns from the science department that I usually heard from the mathematics department—that students were having trouble making connections between similar ideas and with higher-order thinking—I decided to bring a little science into my Algebra class.

Math labs are nothing new, but I wanted my students to follow the same kinds of steps and write the same kind of reports they would use in the science classroom. This would ideally help students in both subjects, and was an exciting way to employ discovery learning in a way students had rarely (if ever) seen outside of science class.

This sample lesson is focused on observing what changing the parameters of a linear equation does to its graph.

How to Use It

This particular lab should be used when studying linear equations, slope and y-intercept.

In general, labs can be used whenever the teacher wants to employ inquiry or discovery-based learning in a fresh, engaging way.

Needed Materials

- Graphing calculators
- Copies of *Math Lab* report for each student

Sample Lesson

Time Needed: Two 45-55 minute class periods

Objective: Students will be able to predict the shape of graphs of linear equations when the slope and y-intercept are changed.

Warm Up/Do Now: Students will complete the following: “Complete the tables and graph both lines on the same coordinate plane.”

x	y
-2	
0	
2	

$$y = x$$

x	y
-2	
0	
2	

$$y = x + 1$$

Introduction: Compare and contrast the two graphs. Ask students if they see a pattern. What do they think $y = x + 5$ would look like? Pass out and discuss the purpose of the Math Lab as described below:

The lab follows the scientific method and the structure of lab reports students will have to write for science classes, as outlined below:

1. **Pose a question:** How can we predict the shapes of linear equations without a calculator?
2. **Do research:** Already done through our previous work.
3. **Construct a hypothesis:** In class, I define hypothesis and connect it to what they have done and will do in future science classes. Based on our work thus far, what do they think is the answer to the question we posed?
4. **Test the hypothesis in an experiment:** The students will graph groups of linear equations with one parameter changing (y-intercept only, increasing and decreasing slope, changing the sign of the slope) with calculators, in order to make observations to help us figure out what will happen even without calculators.
5. **Make observations and analyze data:** Students answer a series of focused questions about their data.
6. **Draw a conclusion:** Was the hypothesis correct? What did you learn from this lab?

Guided Practice: Read through the beginning of the lab together, especially the procedures. Be sure to have students make their hypothesis before they start.

Independent Practice: Students will work individually or in pairs to complete the lab.

Closing: Discuss their observations thus far. Do they think they have an answer for the hypothesis already? Answer questions and clarify anything that is confusing. The next day, have students predict the shape of a simple linear equation without a calculator as a Warm Up/Do Now.

Best Practices

The temptation to add additional groups of equations and have students observe even more drastic changes is strong, but as with the other ideas in this book, you don't want to take the focus off your main idea or cause unneeded confusion. You can always do additional labs later to observe other graphs, and at that point you can reference this earlier work.

Be aware that students may find the wording of the observation questions difficult, and rephrase and clarify it as needed. Making connections between various representations of equations is an essential skill that takes time for students to learn.

Adapting and Extending This Idea

Science classes don't have a monopoly on ready made lab ideas any more—most math textbooks contain labs for each chapter at minimum. Math teachers should be able to find a lab that covers almost any topic they are covering.

Now let's say you're an English Language Arts or social studies teacher. The lab process outlined above very closely mirrors the process of writing a formal essay: pose a question, do research, write a thesis (hypothesis), outline the main points and write a rough draft (collecting data, in this case from your research), write the body paper (make observations about the data you have collected), and write the conclusion. Take the lab example in the *Supplemental Materials*, and with a few simple rewrites you could turn this lesson into a writing lab.

The sample lab included may at first glance look like just another worksheet, which would conflict with what I stated in my introduction. The key to avoid this is to make sure you explain the process, bringing the group back together for reflection on how this process can guide your topic.

Supplemental Materials

- *Math Lab*

Name: _____

Period: _____

Algebra I

Math Lab #1

Title: Investigating Linear Function Graphs

Objective: How can we predict what the graph of an equation looks like without using a calculator?

Hypothesis: I think I can predict what the graph of an equation looks like without using a calculator by

Procedures:

- Graph each group at the same time on the calculator. Put each group on the same graph.
- Label each line with the equation (use **TRACE** to figure out which line is which).
- Write neatly and make your graphs as exact as possible (use the table **2ND GRAPH** to look up the exact points). You won't be able to make observations about changes if you are not careful.
- Use the **STANDARD** window (press **ZOOM 6**)

Data:

Group 1

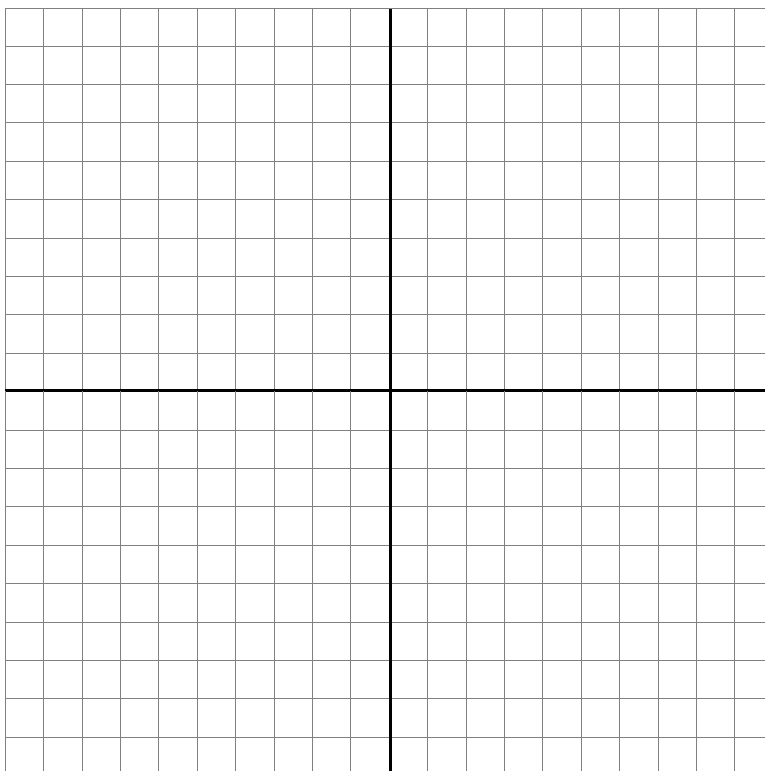
$$y = x$$

$$y = x + 1$$

$$y = x - 2$$

$$y = x + 5$$

$$y = x - 4$$



Group 2

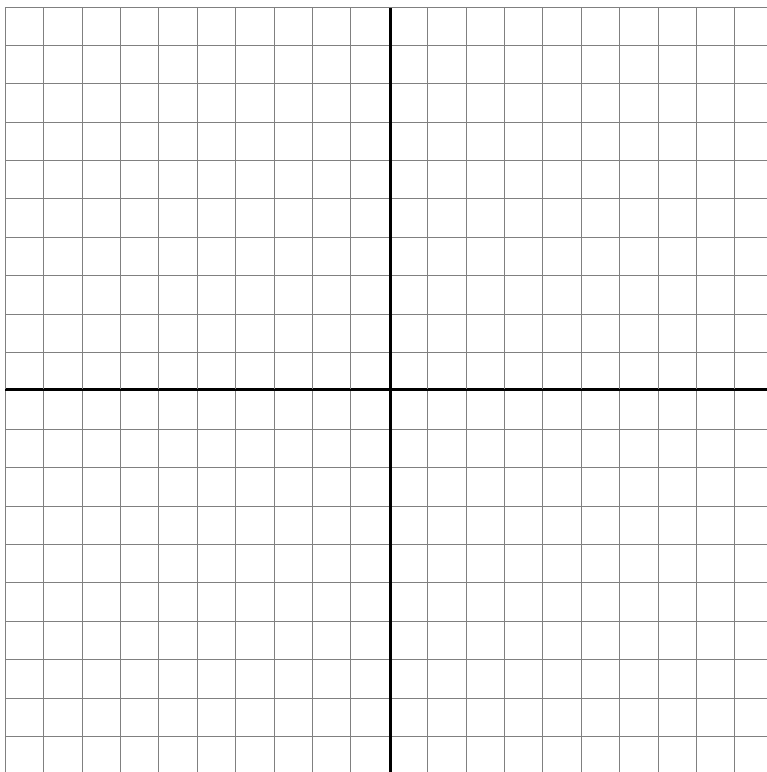
$$y = x$$

$$y = 2x$$

$$y = 5x$$

$$y = (1/10)x$$

$$y = (1/2)x$$

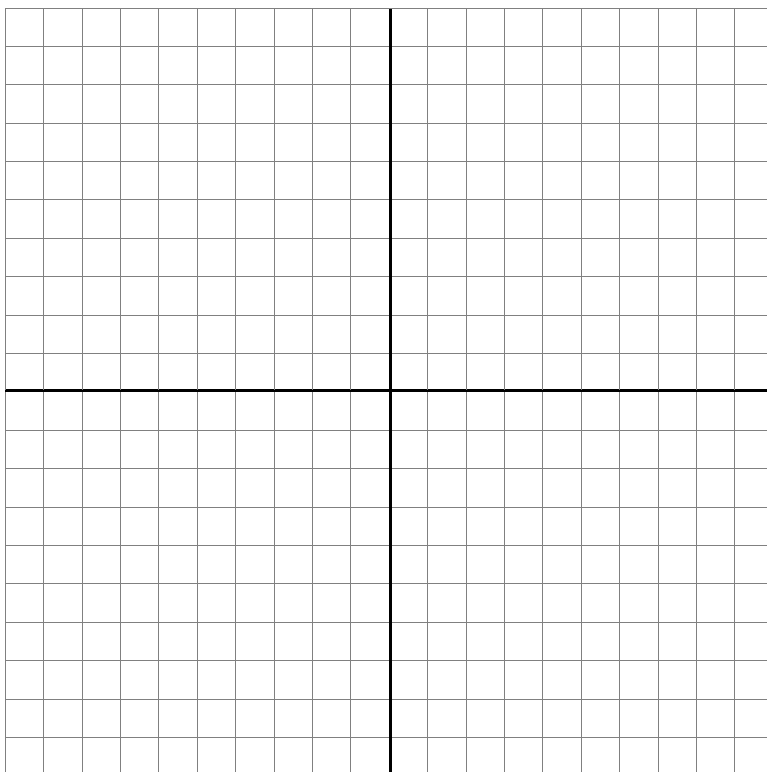
**Group 3**

$$y = x$$

$$y = -x$$

$$y = 2x$$

$$y = -2x$$



Observations:

Group 1:

1. When you add a number to x , what happens to the graph?

2. When you subtract a number from x , what happens to the graph?

3. Compare each graph in Group 1 to the **parent function** ($y = x$). Are the changes in the graph a translation, reflection or rotation? _____

Group 2:

4. The bigger the number you multiply by x , what happens to the graph?

5. When you multiply a fraction times x , what happens to the graph?

6. Compare each graph in Group 2 to the **parent function** ($y = x$). Are the changes in the graph a translation, reflection or rotation? _____

Group 3:

7. When you multiply a positive number times x , what happens to the graph?

8. When you multiply a negative number times x , what happens to the graph?

9. Compare each graph in Group 3 to the **parent function** ($y = x$). Are the changes in the graph a translation, reflection or rotation? _____

Conclusion:

I can predict what the graph of a **linear equation** will look like *without a calculator* by

What I learned in this lab was

Idea #6

Newspaper Activities

Background

It's hard to get students to want to read and even harder to get them to enjoy reading. Years ago, while teaching at an alternative school in the Rio Grande Valley of Texas, I was introduced to the idea of a DEAR (Drop Everything and Read) program. We didn't have a large selection of books, but even if we had, books of any length are intimidating to students who are reading well below grade level. So we also had newspapers delivered through the Newspapers in Education program two days a week. I noticed immediately that even the reluctant readers wanted to read on "newspaper day", so I started to buy newspapers so we would have them every day. Stories in the paper led to many great discussions and, more importantly, instilled the idea that reading could be fun and interesting.

When I began teaching math at a traditional high school, I ran into the same reluctance to read during our DEAR-style period. I again reached into my wallet to provide newspapers every day and saw a big improvement. I realized as the papers began to pile up that I should maximize the use of these resources. Like most things in life, the newspaper is full of practical applications of mathematics. As we approached May and I needed an engaging way to review for end-of-year exams, I turned to the newspaper. Later, it became an easy-to-use resource for teaching other concepts as well.

How to Use It

The Newspaper Mini-Project and sample assessment questions specifically focuses on rate, ratio and proportion problems and should be used to reinforce, review or reteach this topic.

The Newspaper Review was designed as part of our review for end-of-year exams. It would be best used as a one day activity for a week of different types of reviews.

Needed Materials

- At least 1 newspaper for every 4 students
- Copies of Newspaper Mini-Project handout

Sample Lesson

Time Needed: One 45-55 minute class period

Objective: Students will apply rates, ratios and proportions in problem solving situations.

Warm Up/Do Now: Students complete a word problem based on a real-life situation. For example: "At Renter's Paradise, you can rent to own a 19" LCD TV for \$10 a week for 52 weeks. At a retail store, you can buy the same TV for \$225 dollars. How much does it cost to get the TV from Renter's Paradise? How much more are you paying than the retail store?"

Introduction: Discuss the solution to the warm up problem. Discuss with your students how rent-to-own businesses take advantage of low-income communities as a real-life example of

a rate problem. Tell students we'll be looking at more real-life examples by using the newspaper to do our math work today.

Guided Practice: Distribute the Newspaper Mini-Project and arrange students into groups. Distribute the newspapers. Show students who may be unfamiliar with the organization of the newspaper where to look to solve the problems.

Independent Practice: Students complete the Newspaper Mini-Project independently. Monitor and answer questions when necessary.

Closure: As a whole group, use a supermarket ad to find unit rates of different items and connect this to the day's lesson.

Best Practices

Make sure to be explicit about the section or feature that your students need to use to complete your assignment. Similarly, if you have several days worth of papers in class, refer to sections that appear daily (or those you know the schedule of) so it doesn't matter which day the paper is from.

This project can be done as a single event, which would only require purchasing papers for that day. If you're interested in using the papers on a regular basis, you need to get involved in your local Newspapers in Education program (you will likely find a link on your local newspaper's website).

The example activity below refers to sections of my local paper that appear daily, so that it didn't matter which day's paper they used as long as they had all the sections needed. We had discussed a problem about rent-to-own businesses as a real-life example of a rate problem, and so when I saw an ad for one in the paper a few days later, I put that similar problem on the weekly quiz (also included below).

Adapting and Extending This Idea

The best extension of this idea is to get newspapers for your classroom on a regular basis through the **Newspapers in Education** program (<http://www.nieonline.com>), which provides free or discounted papers for classroom use. Contact the education coordinator at your local paper to get involved. Many papers have sponsors already lined up for you; even if you can't get a sponsor, the price of ordering through the newspaper is a fraction of the newsstand price.

If your school doesn't recycle, there will be quite a bit of newspapers piling up if you enroll in the NIE program. **Offer papers to other teachers** for current events, art projects or other classroom uses.

The newspapers could also become part of a **classroom library**, or used during any Sustained Silent Reading/Drop Everything and Read period you have to help get reluctant readers going.

Create a "real world" bulletin board and post relevant stories from the paper on the wall. These can simply be something to make your classroom more vibrant and inviting, or can be offered as extra credit.

You can use newspapers to help start an ongoing **Fantasy Football and Mathematics** project. Visit <http://www.fantasysportsmath.com> for more information.

Supplemental Materials

- Newspaper Mini-Project
- Newspaper based quiz question
- Newspaper Review

Newspaper Mini-Project

NAME:
PERIOD:
Algebra I

Front Section (section A)

Find "**PESO WATCH**" on page **2A**. Use proportions to solve!

1. Current rate for the peso: _____. Current rate for the dollar: _____.
2. How many dollars could I buy for 2300 pesos? _____. Now change that back into pesos. Are you losing or gaining money? _____ How much? _____
3. How many pesos could I buy for \$230? _____. Now change that back into dollars. Are you losing or gaining money? _____ How much? _____

Find "**DROUGHT WATCH**" next to "PESO WATCH".

4. Look at the levels for Falcon Lake. Make a fraction of $\frac{\text{current level}}{\text{normal level}} = \frac{\quad}{\quad}$.

Turn this fraction into a decimal: _____. This means Falcon Lake is at _____% of normal levels.

Valley & State (GREEN, section B)

Find "**GAS WATCH**" on the front page of the section and answer the following questions:

1. Lowest **unit rate** (price per gallon) of gas: _____. Highest **unit rate** of gas: _____
2. Cost to fill a 25 gallon tank at the highest price: _____. Cost to fill a 25 gallon tank at the lowest price: _____
3. What's the **range** (*difference between high and low*) of prices you would pay? _____

Sports (BLUE, section C)

Find the "**SCOREBOARD**" page. Look at the **MLB (baseball) standings**.

Next to each team's win-loss record is the "PCT" for their **winning percentage** (percentage of games they have won so far). For example, **.561** means that teams is winning **56.1%** of their games.

1. Pick any team and write the city, win-loss record, and the "PCT": _____
2. Change the PCT decimal to a percent: _____
3. Baseball teams play 162 games. Use the **winning percentage** you found to figure out how many games out of 162 that the team will win (*multiply the percentage times 162*) _____

[Sample follow-up assessment questions on rates using an example from the newspaper.]

Use the newspaper ad below to answer #1-4.

Quick Cash

Borrow \$5,001
for just **\$147.00** per month

Amount Financed	Monthly Payments	Number of Payments
\$5,001	\$147.00**	48
\$1,500	\$59.43*	36

*Annual Percentage Rate 24.74%. **Annual Percentage Rate, 19.24%

• Emergencies
• Bill Consolidation

1. How much do you actually pay after 48 months for the \$5,001 loan?

2. How much do you actually pay for the \$1,500 loan? _____
3. In the end, how much more do you end up paying above the \$5,001 loan? _____
4. In the end, how much more do you end up paying above the \$1,500 loan? _____

Newspaper Review

Algebra I

NAMES:

PERIOD:

Use the newspapers available in class to complete each of the following tasks. For some tasks you need to cut out and include the parts of the paper you used to hand in.

Use the weather page

1. Find the **mean, median and mode** of the high temperatures for all of the cities listed on the state map for the same day.

Mean: _____

Median: _____

Mode: _____

2. Which measure of central tendency in #1 was the highest?

3. Find the temperature for our city (or closest to it). **Convert the temperature** in Fahrenheit (°F) to Celsius (°C) using this formula:

$$C = (5/9) * (F - 32)$$

Temp in F = _____

Temp in C = _____

Use the classifieds and other ads

4. Find the best used car possible (lowest mileage, little damage, etc) where **price < \$10,000**. [Attach your example]
5. Find a used car (or any vehicle) with **mileage > 100,000**. [Attach your example]
6. Find a clothing ad. **Write an equation** for how many shirts (s) and jeans (j) you could buy at the same time for \$50.

Equation: _____

7. Find a "Help Wanted" ad that includes a yearly salary (s). **Figure out how much** you would make each month (m) minus about 25% in taxes (use the equation below).

$$m = (s - 0.25s) / 12$$

Salary (s): _____

Monthly income (m): _____

Use the whole paper

8. Find an information graph (line, bar, circle, etc). **Write a question** for other students where they have to use the information in the graph.

9. Find an example of **independent and dependent variables** in a story OR 2 pictures to illustrate the difference between them! [*Attach your examples*]

10. Find a chart or story about gas prices. **Write an equation** for the total cost of gas (c) to fill a tank with (g) gallons of gas.

Equation: _____

BONUS

- Find a scatter plot and find the correlation (positive, negative or none) [*Attach your example and answer here*] _____
- Find a line graph and find the slope (rate of change) [*Attach your example and answer here*] _____
- Find a story about math in the real world [*Attach your example*]

Idea #7

Songs and Music

Background

There are a lot of things in math that are easy concepts to understand, but also easy to forget. Last year, my students had a lot of trouble remembering the definition of domain and range. It dawned upon me to write a song to get this idea across for two reasons: music is one of the most powerful (and neglected) learning modalities, and it was something to get my students excited about coming to class.

At that time, one of the top songs in the country was Beyoncé's catchy, guitar-driven hit "Irreplaceable". I would hear this on the radio daily, and I had even learned to play it on guitar because I liked it so much. Somewhere in this time, the opening lyrics: "To the left, to the left..." jumped out at me. My students had trouble remembering that when looking at a graph, the domain was from the left to the right. "To the left" became "to the right" and honestly, the rest was easy. I made sure that the most important and basic ideas they needed to know were addressed in the lyrics:

- **domain:** x-values, left to right on the graph, first number in a coordinate point, always ordered from least to greatest
- **range:** y-values, up and down on the graph, second number in a coordinate point, also ordered from least to greatest

How to Use It

Songs can be used for any material that students need to memorize and understand. The domain and range song described here was used to reteach and review the topic when seemingly nothing else had worked.

Needed Materials

- Guitar (or instrumental music)
- Tabs or chords for "Irreplaceable" by Beyoncé
- Copies of the *Domain and Range Song* for each student

Lesson Plan

Time Needed: One 45-55 minute class period (or less)

Objective: Students will be able to identify the domain and range of a function, solution set, or graph.

Warm Up/Do Now: Start with a problem reviewing what you have taught so far, for example: "Identify the domain and range of the following solution set: $\{ (3, 6), (3, -5), (5, 2), (-1, 4) \}$ "

Introduction: Introduced the song by asking, "How do you remember the alphabet?" Most likely, everyone will start singing the alphabet song. "Yes," you explain, "and the reason you were taught this song is not because it's a cute little song but because it is easy to remember. You learned something from this song— isn't it true that you could name me the lyrics to [insert popular song of the moment here] quicker than you could explain the

easiest things we've done in class?" This, you explain, is the idea behind the Domain and Range Song.

Guided Practice: Perform the song (with guitar accompaniment) once alone, directing your students to read and listen to the lyrics so they can help you sing the second time around. After the first performance, invite students to sing along, especially the key terms and phrases marked in boldface.

Independent Practice: Students complete challenging standardized test-style questions about domain and range, using the lyrics to help them.

Closure: Ask each students to list the different ways to identify domain and range as an exit slip.

Best Practices

It is easy to find songs for elementary students online, most of which are based on generic, traditional music (think "Home on the Range" or Christmas songs). There are entire websites devoted to selling CDs of "educational music," designed to teach specific topics. Avoid this crap at all costs. The music is awful, and your students will tune out immediately. Today's high school students need to be engaged at their level, with their music. They'll listen and learn not only because you're using music they want to hear, but also because you're making an effort to understand and respect where they're coming from (which will no doubt help build a positive classroom culture). See the adaptation ideas below if you're interested in creating your own songs.

You shouldn't force students to sing along—that's for elementary students. Ask them to sing along if they want, and maybe ask them to join in on key words and phrases instead. You need to sing or perform the song yourself first, and then sing it at least twice with your students. If you picked the right song, they will be asking you for the chance to do it again (probably because they want to join in).

Follow up with relevant problems in the same class period, and the next day. Allow them to keep copies of the song so they can refer to it to help them with problems. You could even allow them to use it as a guide on a short assessment.

Adapting and Extending This Idea

Students can write their own songs or raps as a small project on a specific topic or as an option on a larger project (see **Idea #2**).

The example provided here dealt with a specific topic in math, but obviously you could use this to help students memorize and understand any topic in any subject. The key is finding the right song. Use songs of the moment, songs students are listening to repeatedly. This is not hard to figure out—if you pay close enough attention you can figure out favorite tracks, artists and radio stations which can then serve as part of your source material.

If you are musically inclined, it is always advisable to find a song you can either play yourself (find tabs or chords for guitar online) or find instrumental or karaoke versions of the music to accompany your modified lyrics. Many artists release instrumental tracks or entire CDs (chart-topping rapper Jay-Z's "The Black Album" was released as an instrumental version) that can be bought at your local store, online, or sometimes downloaded for free. Similarly, karaoke CDs are more widely available than ever, and up-to-the-minute discs are released regularly.

If at all possible, write the songs yourself—your kids will be amazed and impressed by your ability and your clear desire to help them learn in a fun and interesting way. If that seems too daunting, there is no shortage of ready-made lyrics ready to be performed, but heed my earlier warnings about their quality. No matter your musical ability, your students will appreciate (and more importantly remember) your lesson if you incorporate some aspect of this idea into it.

Supplemental Materials

- The Domain and Range Song

THE DOMAIN AND RANGE SONG

To the tune of "Irreplaceable" by Beyoncé

To the right, to the right
To the right, to the right
Everything in the **domain** from the **left to the right**

On the graph, domain's the **x**
From **least to greatest**, and here's what's next
I'm talking about the **range**--that's the **y**
how far **up and down** the graph goes at the same time
Look at that from bottom to top too
So you can answer the questions that I gave you

Sitting in Mr. D's class, thinking bout how he's such a fool,
How we'll never ever forget how to do
domain and range yeah

You must now know domain, you must now know the range
I can help you understand in a minute
Matter fact, you'll pass the test in a minute, baby

You must now know domain, you must now know the range
I can help you understand for tomorrow
So don't you ever for a second ever forget, domain and range!

So when you have a **coordinate point**
A pair of **x and y**, just remember this
Baby the first number's the **domain**,
The second number's the **range**
Cause the truth of the matter is... domain and range are so is easy!

[Chorus]

Idea #8

Students Become the Teachers

Background

Looking for a way to break the monotony of weekly assessments? Instead of giving the students another quiz, have them assume your role and create a quiz. You provide the topic, source material, and as much or as little guidance as you think appropriate to start them on their way. They are forced to think about the type of questions you would have asked them anyway and how to answer them. If they create a multiple choice quiz, they also think about the type of mistakes students would typically make in order to create logical, challenging answer choices.

How to Use It

These can be used as a weekly assessment or a study guide.

Needed Materials

- Copies of Slope-Intercept Study Guide and "Create a Quiz" (Slope-Intercept) Project
- Source materials for questions (assignments, notes, previous assessments, textbooks, workbooks, etc)

Sample Lesson

Time Needed: One 45-55 minute class period

Objective: Students will be able to identify the slope and y-intercept of an equation in slope-intercept form, write and graph equations in slope-intercept form, and write and graph equations using intercepts.

Warm Up/Do Now: Provide the answers for the Slope-Intercept Study Guide given as homework the previous class (located on the "Create a Quiz" Project handout). Have students correct their papers and answer questions together.

Introduction: Explain to your students that instead of taking a quiz, they will "be the teacher" and create a quiz that could be given to other students. The study guide questions are the type that would have been included on a quiz, and are their examples for the project. The quiz they create will follow the same format and wording; they will supply their own equations, numbers and answers.

Guided Practice: Refer to all previous notes, assignments and textbook pages as sources for their questions, but remind students that they can create their own. Give examples of effective and ineffective answer choices.

Independent Practice: Students complete the "Create a Quiz" Project individually or in groups.

Closure: Borrow some questions from volunteers to pose to the rest of the students as an informal assessment.

Best Practices

As noted above, stress the importance of effective, challenging answer choices. In an early version of this project, I made the quiz-making process easier by borrowing a trick from my favorite teacher, Mr. Cosgrove, who taught 10th grade US History. "Cos", as we called him, would always throw a few jokes into his tests:

This is where General Robert E. Lee surrendered to General Ulysses S. Grant at the end of the Civil War:

- A. Appomattox Court House
- B. Gettysburg
- C. Bull Run
- D. In a steel cage match

Even better, sometimes he just made sure you were paying attention:

A result of the French and Indian War was that King George III declared:

- A. The Proclamation of 1763
- B. Go back to answer A.
- C. Seriously, check out A again.
- D. Why are you still reading this? The answer is A!

In the iteration of the project detailed here, I used "joke" answers like these as an example of an **ineffective assessment**.

Vary the number of questions you have your "teachers" create based on how quickly they work. This project is ideal for one day, so base your number on that time frame. Similarly, you may want to allow your students to work in pairs or groups if you know they might have trouble getting started on a seemingly difficult task.

Adapting and Extending This Idea

If certain "teachers" create truly excellent quizzes, or the good work of several students can be combined, **give this back to the other students** in their period as homework, a review or a take home test to once again reinforce the concepts.

When adapting this to other content areas, start with the questions you would have put on a test or quiz and base the rest of your project off of these.

Alternately, you could twist this idea a little further and create a **fake quiz** that was allegedly taken by a "former student" who totally bombed it. To make it look authentic, first write and print out a quiz in the same font and style that you normally use on quizzes. Include a date close to (but not exactly) the current date from the previous year (check a calendar, because some students might just do that to see if it was a weekday!). Write your corrections as you normally would.

Next, mark all (or almost all) of the answers incorrectly, including the typical markings that students would make on questions. Most importantly, do not write in your normal handwriting. Try writing with your other hand, or get someone with sloppy handwriting to do it for you. Have them write a convincing-sounding name and make sure that you then cross it out with a permanent marker, letting just enough show through for it to look realistic.

When you have your fake test fully written, crumple it up and flatten it back out. Then

photocopy it a couple of times. This will give it the worn look of an old paper and not something you made the previous day.

While all of this may seem like a lot of trouble, you'd be surprised how effective and believable it looks, even to the most skeptical students. Finally, sell this assignment to your students by stressing that you don't want them to make the same mistakes that this former student did on a test very similar to what they will be taking. You have just built an effective and refreshingly unique study guide that your students will actually want to do.

Switching gears for a moment, the idea of letting students “be the teacher” has many applications. Students can literally teach mini-lessons individually or in teams, with you assuming the role of a student (or, if you're concerned about management issues, a “principal” doing an observation). Indeed many of the other ideas in this book involve the students creating engaging materials that will help teach their fellow students. When your students are involved in the educational process in this way, it makes your classroom the kind of place they want to be, which is something all teachers hope for.

Supplemental Materials

- Slope-Intercept Study Guide (homework to give out the class before the project)
- Slope-Intercept Project (Create a Quiz)
- Teacher for a Day (another version of this idea)

SLOPE INTERCEPT STUDY GUIDE

NAME:

PERIOD:

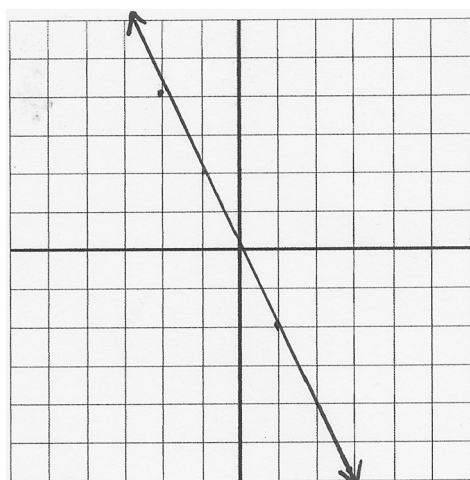
ALGEBRA I

Use the hints to help you. We will check the study guide tomorrow.

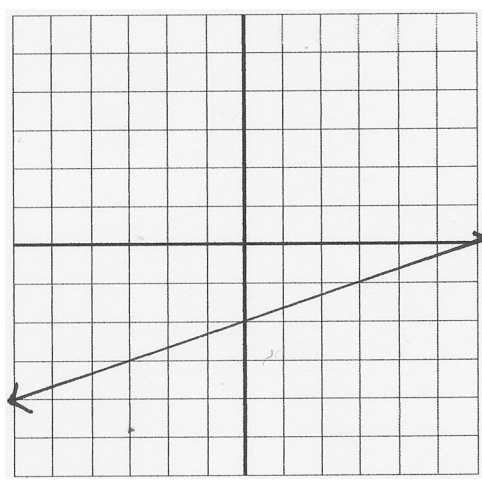
- _____ 1. Find the slope of the line $y = 4x - 6$.
- a. 4
b. 6
c. -6
d. -4

HINT #1: Slope-intercept form means $y = mx + b$. m = slope, b = y-intercept

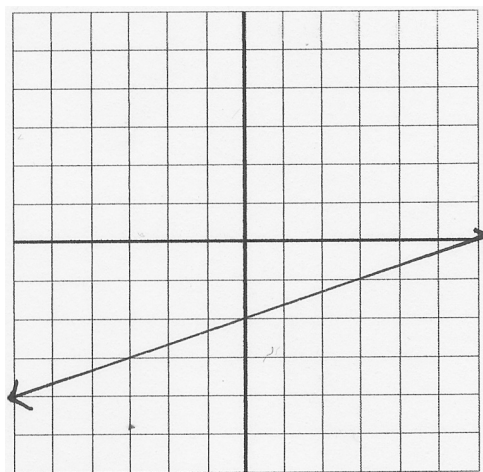
- _____ 2. Graph the line with slope $\frac{1}{3}$ and y-intercept -2.



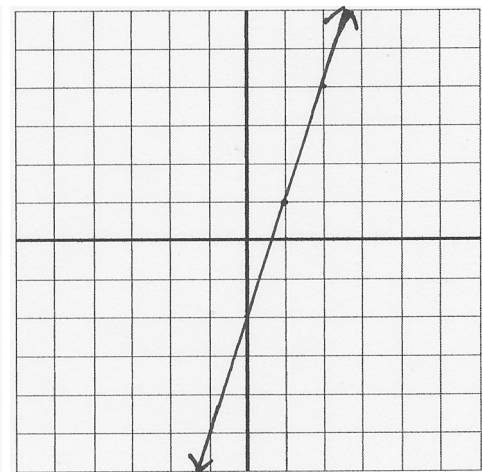
a.



C.



b.



d.

HINT #2: To graph an equation, make a point at the y-intercept, then use the slope to count up or down, then to the right to find the next point.

_____ 3. Write the equation of a line with slope 2 and y-intercept $\frac{3}{4}$ in slope-intercept form.

a. $8x + 4y = 3$

b. $y = \frac{3}{4}x + 2$

c. $y = 2x + \frac{3}{4}$

d. $x = 2y + \frac{3}{4}$

HINT #3: Slope-intercept form means $y = mx + b$. m = slope, b = y-intercept

_____ 4. Find the slope of the line $3x + y = -12$.

a. $-\frac{1}{3}$

b. 3

c. $\frac{1}{3}$

d. -3

HINT #4: Follow the steps for rewriting the equation in slope-intercept form:

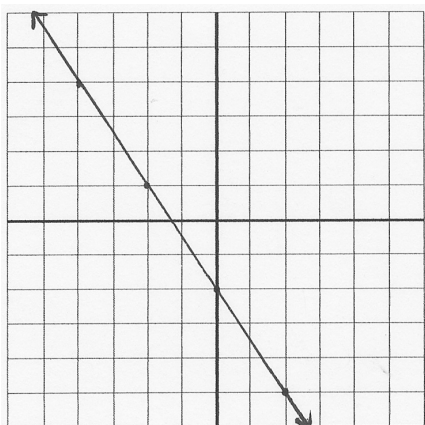
1. Add or subtract (get y by itself)

2. Put x in front

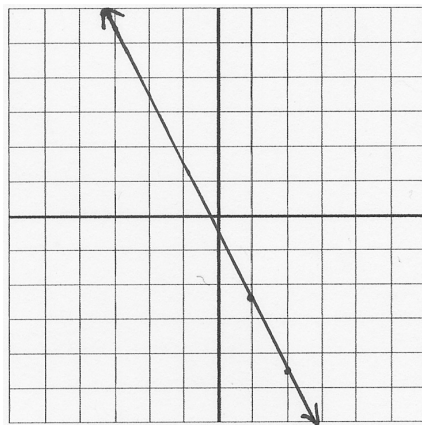
3. Divide everything by the number in front of y

_____ 5. Graph the equation $y = -\frac{2}{3}x - 2$.

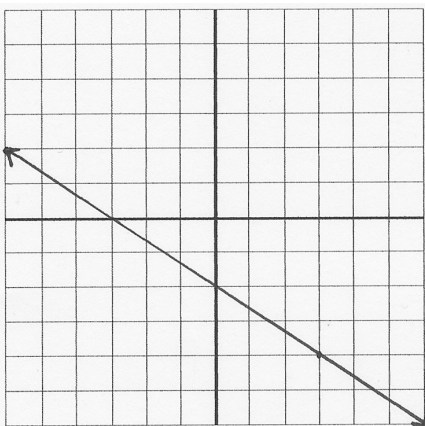
a.



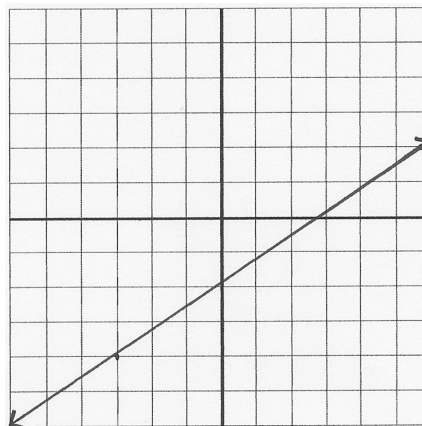
c.



b.



d.



HINT #5: To graph an equation, make a point at the y-intercept, then use the slope to count up or down, then to the right to find the next point.

SLOPE-INTERCEPT PROJECT: CREATE A QUIZ

Directions:

Write a 5-question, multiple-choice quiz. **Include an answer key.** Your questions should follow this format:

1. Find the slope of the line $y = \underline{\hspace{2cm}}$.
2. Graph the line with the slope $\underline{\hspace{2cm}}$ and y-intercept $\underline{\hspace{2cm}}$.
3. Write the equation of a line with slope $\underline{\hspace{2cm}}$ and y-intercept $\underline{\hspace{2cm}}$ in slope-intercept form.
4. Find the slope of the line $\underline{\hspace{2cm}}$.
5. Write the equation $\underline{\hspace{2cm}}$ in slope-intercept form. Then graph the equation.

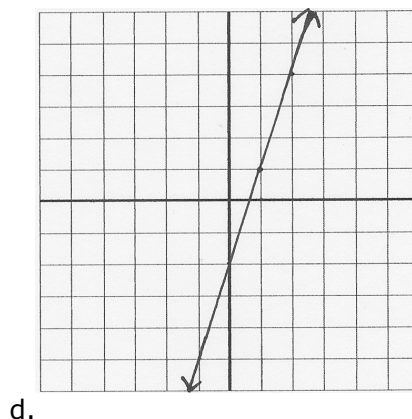
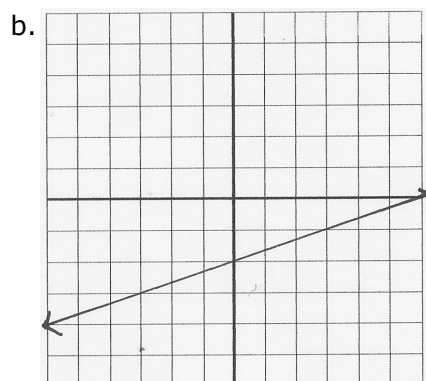
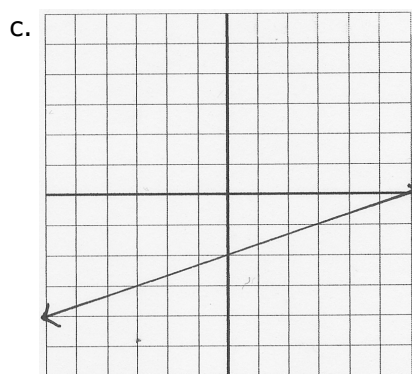
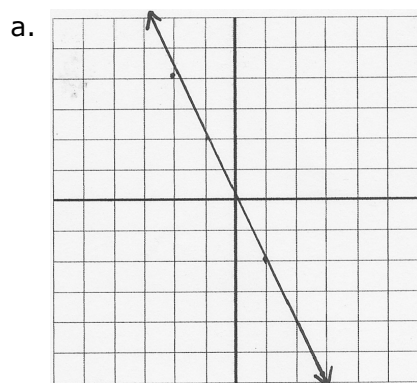
Each question should have four answer choices. Use the example quiz below to help write your quiz.

DO NOT COPY ANY OF THESE EXAMPLES FOR YOUR QUIZ. CREATE YOUR OWN OR USE EXAMPLES FROM YOUR NOTES, CLASSWORK, AND THE TEXTBOOK.

Example Quiz (w/ answers):

- A 1. Find the slope of the line $y = 4x - 6$.
- | | |
|------|-------|
| a. 4 | c. -6 |
| b. 6 | d. -4 |

- C 2. Graph the line with slope $\frac{1}{3}$ and y-intercept -2.



C 3. Write the equation of a line with slope 2 and y-intercept $\frac{3}{4}$ in slope-intercept form.

a. $8x + 4y = 3$

b. $y = \frac{3}{4}x + 2$

c. $y = 2x + \frac{3}{4}$

d. $x = 2y + \frac{3}{4}$

D 4. Find the slope of the line $3x + y = -12$.

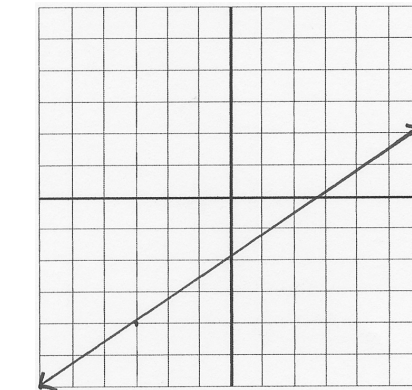
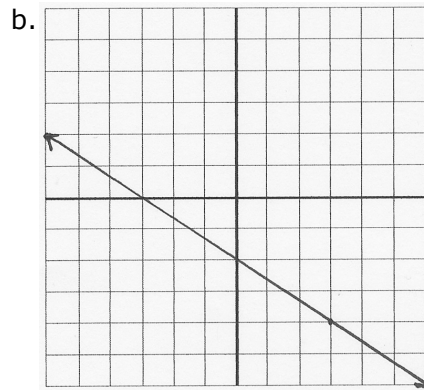
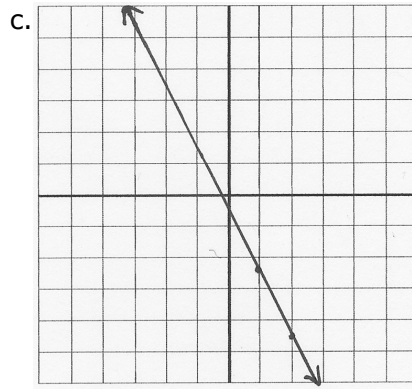
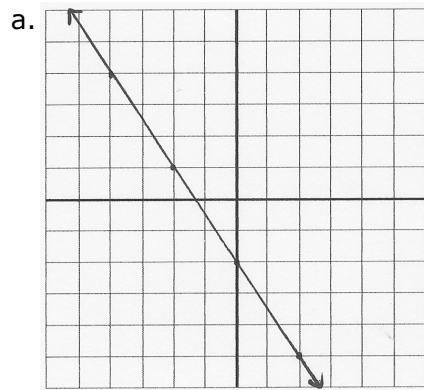
a. $-\frac{1}{3}$

b. 3

c. $\frac{1}{3}$

d. -3

B 5. Graph the equation $y = -\frac{2}{3}x - 2$.



DO NOT COPY ANY OF THESE EXAMPLES FOR YOUR QUIZ. CREATE YOUR OWN OR USE EXAMPLES FROM YOUR NOTES, CLASSWORK, AND THE TEXTBOOK.

****Include the answer key!!****

TEACHER FOR A DAY

The Problem

It is almost time for the Six Weeks Test! You are not sure if your students are ready for it, so you need to make a quick quiz that you can use to help them prepare.

What to Do

Make a 10 question, multiple choice quiz.

How to Make Questions

Pick questions from our notes, assignments or make up new ones. You must have 2 of each of the types of questions below:

- Addition or Subtraction Equations (example: $x + 2 = 3$)
- Multiplication or Division Equations (ex: $2x = 4$)
- Two Step Equations (ex: $2x + 2 = 8$)
- Combining Like Terms (ex: $2x + 3x + 4x = ?$)
- Distributive Property ($3(4x + 4) = ?$)

How to Make the Answers

Each question should have 4 answers that you choose like this:

1. The right answer
2. 1 really close answer (the one most students would pick if they got it wrong)
3. 1 not even close answer
4. Answer D should always be a joke answer that is funny or silly so that your students don't get too stressed out about the quiz

The quiz will be pretty easy, but it should be—you don't want your students to have a nervous breakdown before the real test!!

Here's an Example

1. Solve for x: $2x - 1 = 17$

- | | |
|--|---------------------|
| A) 9 | <-- right answer |
| B) 8 | <-- close answer |
| C) -17 | <-- way off answer |
| D) New York Jets 28, Buffalo Bills 20
JETS!!!!!!) | <-- joke answer (GO |

What to Turn In on Tuesday

Your completed test (1 per group), written or typed neatly, with the answer key.

Idea #9

A Basketball Review Game (That Doesn't Involved Crumpled Paper Thrown in the Wastebasket)

Background

I have always used games to review for tests and quizzes—they they make the often painful work of reviewing fun, easy and memorable, they help break up a sometimes boring routine, and they can make your students excited about coming to class. Last year, I developed a version of the common basketball review game.

The twist I added to the versions I've read about is that I thought it would be fun to use one of those giant inflatable basketball hoops that you find in the sports section of any big box retailer. I can't stand the idea of using a garbage can as a "hoop" and wads of paper as a "ball"—my students would be insulted if I tried to pull that trick. I wanted it to be as authentic as possible without leaving the room.

The hoop I bought was 6' tall with a ball 16" in diameter, all for \$20. While this was a little bit more than I wanted to spend, it paid for itself after a couple of uses. It was big enough to make an impression, but small enough to fit inside the room.

How to Use It

This is a review game to use before an exam of any size.

Needed Materials

- Giant inflatable basketball hoop and ball

Sample Lessons

Time Needed: One 45-55 minute class period

Objective: Students will demonstrate mastery of selected material by participating in a competitive game.

Warm Up/Do Now: Begin with spiral review of the previous day's lesson or a basketball-related problem to get your students fired up about the review game.

Introduction: Explain the rules to your students: The class is split into two teams (one side vs. the other, or divided as you see fit). One student from each team comes to the board to complete a question; whoever answers it correctly first gets a shot for their team. The members of their team will complete the same problem at their desks and offer assistance to their teammates without leaving their desk. Allow students to have their notebooks, classwork and anything else they need to help them and their team.

Guided Practice: Complete a sample problem on the topic you're reviewing as a whole group. Offer hints to the first players if needed as well, but make it clear that each team will be responsible for helping their teammate.

Independent Practice: Students compete in the basketball game, with the teacher explaining problems when necessary. Different students must compete during each round until everyone has played at least once, to insure student participation and engagement.

Closure: Give students a study guide (see **Idea #8**) as homework to prepare for the following day's exam.

Best Practices

Students took shots from the front of the room (near the first row of chairs), which made the shot difficult but not impossible (due to the ceiling, you had to throw it straight or underhand in order to make it). See the *Supplemental Materials* for a picture of what this looked like. When we've played, the games were always low scoring (2 or 3 points total) even when we plowed through a lot of questions and the students took a lot of shots. A close, competitive game is always preferable to a rout.

Here is my advice for running this game smoothly in your classroom:

- Make sure that while the two (or more) students are competing for a shot up at the board that **everyone else is doing the same work**. The easiest way to do this is to inform your kids you'll be collecting all of the work on all of the problems they did at the end of class, and since you will review each answer there is little excuse for students not having complete work and answers for each problem.
- The game play allows consistent opportunities for the teacher to **explain common mistakes and reteach difficult items** by design. After a winner takes their shot, discuss what the winner did right and what (if any) mistakes the other player had made. Point out anything relevant from what the teammates might have been telling their player.
- This game is **ideal for easier content** that requires memorization (the lower levels of Bloom's Taxonomy), although it can be used for concepts that require multiple steps and require higher order thinking (it just may take longer and you won't be able to complete as many questions).
- Depending on your students' level of confidence on the topic being reviewed, you can choose to give everyone the problem first with a chance for them to work on it before coming to the board (which I did when we covered the challenging topic of solving two-step equations and inequalities) or to keep the questions a surprise until they are already waiting at the board (which I did on other occasions when I was trying to get them to visualize and sketch linear equations without a calculator). The latter is better when you are focused on the type of easier material I described above.
- As with any game, you need **very good classroom management** in order to keep everything under control. If you have problems with vandalism, or don't believe your students can handle this without hitting things or each other with the ball, don't even think about using this game.

Don't overuse this or any other review game. This should be used once a grading period or semester at most. The same goes for other games or types of study guides.

Adapting and Extending This Idea

There's a seemingly infinite number of ideas for review games available online. Some of the most engaging and effective are also ridiculously easy to do:

1. Bingo - There are spreadsheets and low-cost software that will automatically generate bingo cards and a call sheet containing vocabulary, math problems, or anything else you would need to review. Real bingo chips are cheap (you can find them at the dollar store), but you can also use pinto beans or perhaps candies that students can eat afterwards. Fair warning: all of these options can cause a huge mess, so if you can print out enough bingo cards for everybody, you could use highlighters or markers instead and dispose of them properly afterwards.
2. Simple "Multiple Choice" Games - When you need to review multiple choice questions, just calling out letters can get tedious. Shake things up by incorporating simple twists, like giving each letter a sound that students must make to answer (A is "moo", B is "bark", C is "meow", etc). You could also mark the four corners of the room A, B, C, and D and have students rush to the corner that matches their answer. If you have a computerized student response system already, this is a cinch.
3. Recursive Note Cards - Each student gets a card with a question on one side and an answer on the other, but they don't match up—the answer to their question is on another student's card. So when the first student reads their question, the student who has the card with the right answer stands up, and then reads their question. Eventually the cards lead back to the first student.
4. Card Games - See **Idea #3**.

Supplemental Materials

- Classroom setup photo



We had to be careful of the low ceiling and especially the sprinkler system, but we had fun!

Idea #10

Preparing for the Test Without Teaching to the Test

Background

Every teacher is affected by standardized testing. If your subject is tested, that is the sole driving force of your curriculum and sole indicator (as far as everyone outside of your classroom is concerned) of your success. It takes over everything you do. If your subject is untested, it's treated like it's not at all important, and your time and resources are taken away in the name of higher passing rates. If you are a teacher that strives to actually teach, instead of merely teaching to a test, this is an increasingly frustrating reality of our profession. There are ways to be successful in this new era of education without killing yourself or your students.

In my teaching experience, these tests have harmed students because school districts and administrators don't know how to both prepare students for tests and educate them successfully. This idea is designed to help achieve both without sacrificing the latter.

How to Use It

This particular lesson is meant to be used in the week or two leading up to your state standardized test. See the sections below for more ideas for long and short term preparation.

Needed Materials

- benchmark test results sorted by student and objectives (or groups of related objectives)
- test prep materials for each objective (see **Best Practices** below)

Sample Lesson

Time Needed: Two 45-55 minute class periods at minimum

Objective: Students will review the standards on which they demonstrate the lowest proficiency to address their needs in preparation for standardized testing.

Warm Up/Do Now: Students will complete a journal: "Which of the topics we've studied are you still confused about? On which topics do you need just a little extra practice?"

Introduction: Discuss the journal topic as a whole group. Tell students that everyone has different areas they need help in, so each of them will be working on the specific objectives they need help in. The most recent benchmark will be used to determine which ones they will work on.

Guided Practice: Show students the review materials they will be using for their particular objectives. Give students their 2-3 weakest objectives (depending on time allotted and length of review assignments) to start with. If students don't see the topics they wrote

about in their journal, advise them to work on those after they've completed their weakest objectives.

Independent Practice: Students complete 2-3 individualized activities. Advise students to help each other on different objectives instead of teaming up with people working on the same area—one person may be strong in the same area that another is weak in, and vice versa.

Closure: Tell students that you will work on additional objectives below proficiency in subsequent classes or work on a comprehensive practice test (see *Adapting and Extending This Idea* below). As an exit slip, ask students to add to their earlier journal: "Do you feel confident about how you will do on the test? What can you do outside of class to help you pass?"

Best Practices

The key to making this lesson and others like it work is to have the best possible materials for reviewing each objectives. I have used a patchwork collection of materials from every possible source to cover each particular objective effectively. It will require a bit of work on your part, but you can get the resources from several sources for free (or for very little):

1. **Your department** – Your chair(s) and colleagues probably have boxes and bookshelves full of unused test prep material, or material they use that works. Also, check with your curriculum/instructional leader.
2. **Your state education department** – Who better to know what's tested than your favorite bureaucrats from the state capital? They will usually provide study guides, online practice and release tests that you can use to help you build quality review materials. Tech savvy school districts in your state will post their test prep materials online as well. Also, look into other states that have similar state standards and tests for more help.
3. **The Internet** – Besides the sources listed above, universities, individual educators, non-profit and for-profit organizations make resources available freely online. You might have to cut and paste the examples and explanation from one site with the practice problems from another, but what you need is out there in some form or another.
4. **Textbooks** – Newer textbooks are always supplemented by comprehensive test prep materials. If you're not satisfied with your textbook's offerings, ask to see any review copies of textbooks sent to your district or campus when they're working on textbook adoption. Some of the best inspiration I've found was from these free samples.

There is no shortage of test prep materials that you have to pay for as well, but since the ideas presented in this book are designed with the low-budget/no-budget classroom in mind, start with the list above. If you can find the money to buy quality benchmark and practice tests, by all means do so, but be sure to read reviews, seek out opinions or obtain samples before making any significant investments.

The design of the activities themselves is of course the most important part. Follow these guidelines for choosing, designing and adapting materials:

- They should be mostly **self-directed**. While you will of course be teaching your students until the last few moments before the test, there just isn't time to teach every objective in the week or two leading up to the test. More importantly, your students have to be trying to do things by themselves at this point, just like they will have to on the real test. Since in this lesson everyone will be working on different

things at the same time, and subsequently some of it may become homework, you won't always be able to help them. This forces them to figure out how to do it, which should make them more successful.

- It must contain **clear, concise examples**. If there are none, you need to provide some—and in a different way than you taught it previously. As Benjamin Franklin once said, “The definition of insanity is doing the same thing over and over and expecting different results.” This also helps with making it self-directed as described above.
- They need to be a **reasonable length**. It will be too close to the test to start stressing your students out with unnecessarily long test-like materials. Success will come from addressing the same objectives in different ways, not through excruciating repetition. In addition, students may need time to address other weak objectives as well.
- **Not everything should be multiple-choice** or otherwise formatted like your state test. If students can answer questions, and better yet explain their answers without the aid of a list of possibilities, they have truly mastered the material (and you thus have nothing to worry about come test day).

Adapting and Extending This Idea

I hope that no one reads this idea or anything from this book and interprets it as teaching towards the test. This is a lesson to use in those last crucial days before the exam, when it is completely reasonable to focus on the test. There are many ways to prepare your students for high-stakes testing, the best of which involve **deconstructing** the test.

One way to deconstruct the test that you could use in any content area is something I call a **Weak Objective Tuning Activity**. Your students work in groups to analyze selected problems from a recent benchmark test that most students missed, and create a study guide that answers three crucial questions:

1. What do you need to know to get the correct answer?
2. What was the most common mistake made and how do we avoid it?
3. How can we help students remember how to do this kind of problem?

Another deconstruction method is to give students a set of questions where the correct answer is already circled, and students are asked to show why these are the right answers (i.e. show the work) beside the question. This is as simple as cutting a page of multiple-choice/test formatted questions up into strips; questions on the left half, space for explanations on the right. They should show work, formulas, or evidence from notes that would justify the answers shown.

Of course, you could also use **Idea #8** to help deconstruct the tests and force students to think deeply.

As far as taking practice tests, I have given complete practice tests as a **take home project** in the weeks leading up to the test, which eliminates the pressure of the testing environment and allows them to get help. This test was **coded** with a key that marked easy, challenging, and hard questions as well the few we had yet to cover in class. I told them to use the key to help guide them through it, working their way up to the hardest questions. Most importantly, **their grade was not based on their immediate results**, but on their effort in fixing it when it was returned to them. I would suggest having some sort of assignment where as long as the students keep fixing their practice tests until every single question is correct, they would get a high grade, so the emphasis would be on their success, instead of one do-or-die attempt.

Finally, **save your diagnostic tests** from the very beginning of the year. Give them back to the students around test time and ask them: "How far have you come? Does this look easy now?" Whether you use it as an in-class or take home assignment, it will help build your students' confidence about how much they've learned.

Ten Ways to Find, Create and Adapt Your Own “Cheap Ideas”

Where do ideas like those presented in *Ten Cheap Lessons* come from? If you've read the background story for each idea, you already know that they are pulled from anywhere and everywhere. The key to finding, creating or adapting exciting, engaging ideas for your classroom is an open mind and a constant awareness.

1. The Lost Art of Observation

One of the best lessons I learned from Teach for America was that observing other teachers (and being observed yourself) is an essential tool for reflecting on and then improving your own classroom. Unfortunately, as we gain experience, take on more responsibilities, and endlessly struggle with the limited time we are given for lesson planning and preparation, this simple tool seems too difficult to use and is quickly forgotten about. If you have been inspired by what you've read in this book, take the next step and schedule some observations into your busy week.

Start by visiting your colleagues from your grade level and subject, but be sure to visit other subjects and grade levels as well. I have learned so much from elementary teachers, high school chemistry teachers, and middle school pre-engineering teachers, even though I teach high school algebra. Consider taking time off to visit other schools in and out of your district to seek out the best teachers and ideas (ask your principal if you can count these as professional development hours).

The second half of this is to ask other teachers to observe you. You can either ask them to view your classroom in general, or ask them to look specifically at the structure of lessons or their presentation. Debrief with them shortly afterwards, and get their feedback and ideas. Ask someone who's opinion you trust, who has shared good ideas in the past or is known for engaging students with their lessons.

Perhaps most telling about the value of observation is that many of my favorite, most frequently used lessons don't appear in this book—because they're ideas borrowed from other great teachers.

2. Search the Internet More Effectively

It is amazing that despite all the positive developments for teachers on the web that there remains no cheap or easy way to find lesson plans, projects, and other ideas for your classroom. Often the best lesson for your purposes is hiding on some teacher's well-hidden blog instead of collected on a more popular education site. The alarming growth of companies overcharging teachers to access huge databases of lesson plans isn't helping either. Thus we must learn to search more effectively, which mainly requires only some well placed quotation marks.

When searching for a specific topic, use quotes to find exact phrases (i.e. “king lear” or “graphing linear equations”). Then, include “lesson plan” or “review game” and “high school” or “middle school” to narrow it down to something closer to what you want:

- “king lear” project
- “graphing linear equations” “lesson plan”

- “adding and subtracting integers” “high school” “review game”

If your search is yielding lots of results from something with the same terms that are totally unrelated to your goal, you can add a phrase in quotes, word or website with a minus sign (-) in front to remove it from your search:

- john adams biography -site:wikipedia.org
- "king lear" project -gutenberg

Don't give up on the first try either. Add or remove terms and quotes to get more or less results. What your looking for, or at least one piece of it, is out there somewhere.

3. Revisit Your Own Stuff

I hope you keep careful records of everything you do in the classroom, because you probably have some good resources that just need a little adjustment to become great ones. This means keeping copies of handouts, outlines of your lesson plans and ongoing projects, a sample notebook that mirrors what your students do in theirs, as well as curriculum calendars, websites, student feedback and examples of their completed work.

Besides keeping copies of everything you use, keep notes of what worked and didn't worked when you used them in class. You probably won't remember that all of your students got stuck on the same poorly worded question one year later, so better to write it down immediately so you can reword it when you use it the following year. Ask yourself, “How can I make this more interactive? What can I add to make this more engaging, or remove to make it easier to understand?”

Finally, use the other suggestions here to find missing elements or better ways of teaching the same objectives.

4. Invest your time (and the school's money) in professional development

Readers of **teachforever.com** are well aware of my numerous nightmare experiences at professional development workshops foisted upon me by my school and district. Keeping this in mind, there is professional development out there worth your time and effort. It just requires a bit of research to discern the good from the bad. As with anything, recommendations from colleagues and online reviews are your best tools to navigate the options out there.

I go to every workshop or conference with the mindset that I will take away at least one useful idea, no matter how useless I may find the overall event. With this mindset, you should find something worth using in the classroom. Take advantage of the more plentiful opportunities available during the summer, which could also provide some additional income for cash-strapped teachers.

5. Take a break (or a full blown vacation)

Inspiration strikes most easily when you're not doing anything teaching related. It could be as simple as going outside for a short walk or involve taking a Mental Health Day (see **teachforever.com** for suggestions) and heading to the beach (or the mountains). Lack of

sleep, high stress, and nonstop work will very quickly dry up what's left of your imagination, energy and enthusiasm.

6. Get outside of the classroom (literally)

Look in and around the rest of your school building for alternate settings for your class. This serves two purposes: it breaks up your normal routine, rousing student curiosity and also can help provide the perfect environment to complement a particular lesson. I'm not just talking about the library or computer labs, but hallways, stairwells, lobbies, cafeterias and outdoor areas as well. The mathematics applications are obvious, but different environments could provide places for science experiments, inspiration for creative writing, or space to perform skits for almost any subject. Even if you never end up leaving the comfort of your classroom, you may find places and features to reference during your lesson to provide a real-life connection for your students.

7. Watch for what's trendy among your students

There's no better way to hook your students than to play off of whatever is popular among them, whether it be particular type of music, movies, sports, TV, clothes or pattern of speech. You should already be incorporating bits and pieces into your lessons, but keeping your eyes and ears open will probably yield something you can frame an entire lesson or unit around. Demonstrating that you're in touch with your students will also help build a positive classroom culture, and thus make the rest of your lessons go more smoothly as well (see #10).

8. Buy better resource books

A lot of great ideas can come from teacher resource books, but don't put yourself into debt to build a personal library. As I've learned the hard way, most teacher resource books are just collections of worksheets with very little (or nothing at all) that will engage your students or connect to their lives and the world they know. Visit teacher supply stores and skim through the titles that interest you, borrow from other teachers, and read reviews at Amazon.com and other online bookstores before buying them. Do some searches online to see if similar or identical ideas are already available freely online. Be sure to include books about classroom culture, pedagogy and educational research in your search as well. It won't take long for your students to reap the benefits of your lifelong learning.

9. Use educational TV programming

The expansion of cable television over the last decade has provided a multitude of new channels and programming that can be used in the classroom. Most of these programs are supplemented by websites that feature lesson plans and other ready-to-use teacher resources. For example, Texas Instruments has built an entire curriculum around the CBS drama *Numb3rs*, about an FBI agent who uses mathematics to solve crimes. Cable outlets like the Discovery Channel, National Geographic Channel, A&E, and the History Channel (not to mention non-cable PBS) have been producing educational series and lessons that go along with them for years. With the advent of digital cable and the expansion of satellite, there is no shortage of channels devoted to nearly any topic you might want to cover. Use these programs to present content in a way your students will remember, and to prove to them what you're learning is indeed all around them.

10. Create a positive classroom culture

In Teaching With Love & Logic, by Jim Fay & David Funk, the authors pose this question: “Do students need to like their teachers?” Their answer: Not necessarily, but they do need to respect them. Creating a positive classroom culture is possibly the most important factor in whether any good ideas will work in your classroom. I once knew a teacher who didn't let a day go by without telling me—and everyone else who would listen—how stupid and worthless they thought their students were. You can probably imagine what this teacher's classroom might look like (barren walls, disorganized piles of papers, notebooks and workbooks strewn about), how a typical class period might go (disengaged and/or sleeping students, boring lecture, and endless pages of multiple-choice test prep problems) and how some of these ideas might fare (complete disasters). Trying to think outside the box is a step in the right direction in and of itself, but it cannot work in a vacuum.

Take steps to build positive relationships with your students: talk to them, ask them questions about their lives outside of school, go watch them play a sport or perform in the band, hang their work on the walls, recognize “students of the week”, and above all else, understand that they want to be treated with respect. Obviously this topic has filled hundreds of books and will fill hundreds more. Start by reading what I believe to be the best teaching book ever written, Teaching With Love & Logic, to get started.

If you can accomplish this admittedly monumental task, the process of finding, creating and adapting great ideas for your classroom will become infinitely easier.

More Information

Did you learn something from this book? Do you have suggestions for making it better, or other adaptations and extensions not mentioned here? Whether your comments are good or bad, I want to hear from you. Email me at **teachforever@gmail.com**, or visit my website.

For more information about the author, more ideas, and downloads of the documents available here visit **I Want to Teach Forever: <http://www.teachforever.com>**

I Want to Teach Forever

Information, inspiration and ideas to help keep teachers in the classroom

WEDNESDAY, JANUARY 9, 2008

Mid-Year Student Surveys

The last few days of the fall semester were pretty rough. My students by and large bombed the semester exam, which I had thought was rather easy. The semester had went so well, and all indications were that the students were learning and retaining the information. It tore my well-constructed fantasy world to shreds, and I didn't know what else to say to my students to motivate them to do better.

I don't really yell, and I didn't this time. I usually speak to my students very plainly and honestly, from the heart, and more often than not they respond positively. This time, I told them I was so dejected that I wasn't sure I would even bother coming back after winter break, because it was my responsibility that they had failed so badly. Maybe I'm just not a good teacher, I told them.

There was no chance of me quitting, of course, but I didn't need to do any acting; I was really as upset as I appeared to be, and while I wasn't going to leave, I didn't feel like a very good teacher at all. I looked forward to the spring semester as a chance to prove to myself

About Me



Mr. D
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I teach high school math in south Texas. After graduating Rutgers University in 2003, I joined Teach for America in the Rio Grande Valley. I've taught 8th grade US history, math (5th grade through Pre-Calculus) at an alternative school, and algebra I. I was born and raised in New Jersey.

 [View my complete profile](#)

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Notes

Some of my friends make fun of the seemingly endless array of spiral notebooks I carry around. I'm constantly scribbling ideas for lessons, games, projects and programs for school, as well as personal reflections and articles for my blog. I thought I'd include some space for notes on what you've read here and perhaps for ideas you read about on teachforever.com, so you can keep your thoughts together a little better than I do.

This image shows a full page of white paper with horizontal blue ruling lines. The lines are evenly spaced and run across the width of the page, providing a template for handwriting practice or general writing. There are no margins, text, or other markings on the page.

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